Effigies Authoris.

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ARITHMETICK

A Treatise fitted for the Use and Benefit of such

Trades-Men

As are Ignorant in that ART:

TEACHING

The Nature and Use of

Fractions,

BOTH

Vulgar & Decimal,

By a New and Easie Method
Made familiar to an Ordinary Capacity.

Also the Mensuration of

Solids and Superficies, &c.

By *J. ATRES*, at the *Hand* and *Pen* in St. *Pauls-Church-Yard*, *London*.

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Licensed and Entered ac-
cording to Order.

To The Honourable

Sir *Thomas Cook*,

Governour of the

East-India-Company

THis Small Book being chiefly designed for the Use of such as are concern'd in Trade: It was not Easie for me to find out a Person so proper as your Self, to make a Dedication to. *One*, That by the influence of Divine Providence hath made the World Sensible of the mighty Advantages flowing continually to Industry, from the Daily Use of *Arithmetick* in the way of

Commerce: And withal, having Received Great Favours from Several of the Honourable *East-India Company*, in Imploying me to fit Youths for Their Service at Home, as well as Their Factories Abroad; and Your Generous Disposition of Valuing the meanest things, if Useful to the Publick, Emboldens me to present You this Manual of *Practical Arithmetick*, tho' not worthy either Your Patronage or Inspection: Yet hope it may find a favourable Reception, as proceeding from a Grateful Sense of the Obligations confer'd on

Your most Obliged
Humble Servant,

JOHN AYRES.

THE PREFACE.

THIS *Manual of Practical Arithmetick Adapted chiefly for the* Advantage *and* Uſe of Tradeſmen, *is the product of a few Winter-Evenings, a work for its Nature and Kind different from any thing heretofore publiſhed that I know of, All the Rules being made Plain and Intelligible to the meaneſt Capacities, for whoſe ſakes it is principally intended; which is the reaſon ſo much of the Book is taken up in Explaining and Teaching the Ground-Work, or the four firſt Rules,* viz. Addition, Subtraction, Multiplication, *and* Diviſion, (*which moſt Books are deficient in.*) *And a defect in theſe will render the Labours of ſuch as Learn Arith-*

Arithmetick, very burdenſome, if not ineffectual.

To help which, I have laid down the plaineſt way of Diviſion *(for a Learner that wants the help of a Maſter,) though ſomewhat longer than what I uſually teach in my School. Yet in the Cloſe of the* Double Rule of Three *to the End of the Book, I have purſued the Shorteſt way of* Diviſion, *being neceſſitated thereto. I have alſo omitted ſeveral Rules that are not of uſe in Trade, and which ſerve moſtly to Murder time, ſuch as the* Two Rules of Allegation, Barter, Loſs *and* Gain, Fellowſhip with Time, *&c. And have ſupplyed thoſe Omiſſions with what is more Uſeful and Practical,* viz. *Great Enlargements and Variety of the Golden Rule of Three Direct, The Inverſe Rule, Double Rule of Three, and the uſe of the Compound Rule of* five Numbers *in working Intereſt: Rules of Practice, with* Short wayes to caſt up Merchandize. *The Order of Deducting* Tare *and* Tret *in*

all

all parts required, with other Rules useful to Trade: Lastly, I have made Fractions *very easie and familiar (tho' differing from any former Method) Having mixed both Vulgar and Decimal Fractions together under the same head; That the Ingenious may discover the Ease, as well as Excellency and Brevity of the Decimal, beyond the Vulgar Fraction. And as my Paper would Admit, have Added some Variety of Measuring Superficies and Solids,* &c.

Paul's Ch. Yard
Jan. 25. 92.

Vale,

J. A.

Vols.

1 A.

CHAP. I.

Of NUMERATION.

I. *ARITHMETICK* is the Art of Numbring well, or of Accompting well by Numbers: For as Magnitude or Greatneſs is the Subject of *Geometry*, ſo is Multitude or Number the Subject of *Arithmetick*.

II. The whole Art of *Arithmetick* depends upon the true knowledge of the five following Rules, viz. *Numeration*, *Addition*, *Subtraction*, *Multiplication*, and *Diviſion*. All the other Rules being Compounded of theſe, and of theſe we ſhall treat particularly in their order, and hereunto may (not unfitly) be added the Extraction of Roots.

III. *NUMERATION*, Teacheth to expreſs or write down the value of any Number whatſoever propoſed.

IV. All Numbers are written with ten Characters called Figures, of which the laſt

is called a Cypher, and of it ſelf ſignifieth nothing, but ſerveth (according as it is placed) to increaſe or diminiſh the value of another figure to which it is either annexed, or prefixed.

V. The Ten Characters or Figures by which all Numbers are expreſſed, are thus written, *viz.* 1, one; 2, two; 3, three; 4, four; 5, five; 6, ſix; 7, ſeven; 8, eight; 9, nine; 0, Cypher: The Nine firſt of theſe are called ſignificant Figures.

VI. All Numbers are either Simple, or Compound.

1. A Number is ſaid to be Simple when it conſiſteth but of one Figure, as 4, and 8, and 6, *&c.* are ſimple or ſingle Numbers.

2. A Number is ſaid to be a Compound Number when it is compoſed of two, three, four, or more figures; ſuch as are 35, 356, and 7428, *&c.*

VII. Every ſignificant figure hath a double value, *viz.* Certain or uncertain.

1. The value of a figure may be ſaid to be certain, when it ſignifieth ſimply its own proper value, without the addition of any other word for its explanation, and ſo 4 ſignifieth four, 8 ſignifieth eight, and 9 is nine, *&c.*

2. The value of a figure may be ſaid to be uncertain, in reſpect of the place it may ſtand

ſtand in, and ſo 4 may ſignifie forty, or four hundred, or four thouſand, *&c.* and 8 may ſignifie eighty, or eight hundred, or eight thouſand, *&c.*

VIII. When a Number is compoſed of divers figures ſet together like the Letters in a word, that Number is ſaid to conſiſt of as many places as there are figures uſed in the compoſing thereof. So the Number 4643 is ſaid to conſiſt of four places, becauſe it is compoſed of four figures; the like is to be underſtood of any other.

IX. The places in every compound number are to be conſidered both as to their order, and their value.

1. The Order of the places is from the right hand to the left, the firſt Figure or Cypher towards the right hand is ſaid to poſſeſs the firſt place, and the next towards the left hand, is ſaid to poſſeſs the ſecond place, and the next to that the third place, *&c.*

So if this Number were propoſed, *viz.* 5734, here 4 is ſaid to poſſeſs the firſt, 3 the ſecond, 7 the third, and 5 the fourth place, *&c.*

2. The value of every figure is diſcovered by the place that it ſtands in; *viz.* The firſt place is the place of *Unites*, or ones; and the figure that ſtandeth in that place ſignifieth its own proper, or ſimple value. The

ſecond place is the place of *Tens*, and the figure that ſtandeth there ſignifieth as many *Tens* as the figure it ſelf containeth *Unites*: As if it be 4, it ſignifieth four *tens*, or forty; if it be 7, it ſignifieth ſeven *tens*, or ſeventy, *&c.* The third place is the place of *Hundreds*, and the figure that ſtandeth there is as many *hundreds* as it containeth *Unites*: So 5 in the third place is five hundred, and 6 ſignifieth ſix hundred, *&c.* The fourth place is the place of *Thouſands*, and the figure that ſtandeth therein ſignifieth as many *thouſands* as it contains *Unites*, ſo 8 in the fourth place is eight thouſand, and 4 is four thouſand, *&c.* As,

Suppoſe this Number, *viz.* 4652, were given to have its value expreſſed; The figure 2 (in the firſt place) is two *unites*, or ſimply *two*; the figure 5 (in the ſecond place) is five *tens*, or fifty; ſo 52 is thus expreſſed, *viz. fifty two*: The figure 6 (in the third place) is ſix hundred, ſo 652 is thus expreſſed, *viz. ſix hundred fifty two*; the figure 4 (in the fourth place) is *four thouſand*, ſo 4652 is thus to be read, *viz. Four thouſand ſix hundred fifty two.*

In like manner if any figure hath a *Cypher*, or *Cyphers* annexed to it, it ſhall ſtill Retain the value of its place, as much as if a ſignificant figure, or figures, were annexed to it

in

in the room of the *Cypher* or *Cyphers*; ſo if to the figure 6, there be a *Cypher* annexed thus (60) its value is *ſix tens*, or *ſixty*, becauſe it ſtandeth in the ſecond place, or place of *Tens*. Likewiſe if it have two *Cyphers* annexed to it thus (600), its value is *ſix hundred*, becauſe it poſſeſſeth the third place, or place of *Hundreds*. Alſo 6000 is *ſix thouſand*, becauſe 6 ſtandeth in the fourth place, or place of *Thouſands*.

And the value of any figure increaſeth in a *Decuple* proportion from the right hand to the left, every place being *ten times* the value of the former, as you may ſee in the following Table.

NUMERATION TABLE.

Hundreds of Millions	*Tens of Millions*	*Millions*	*Hundreds of Thousands*	*Tens of Thousands*	*Thousands*	*Hundreds*	*Tens*	*Units*	*The Numbers in the Table are thus to be Read,* viz.
9	8	7	6	5	4	3	2	1	987 Mil. 654 Th. 321
1	2	3	4	5	6	7	8	9	123 Mil. 456 Th. 789
	2	3	4	5	6	7	8	9	-23 Mil. 456 Th. 789
		3	4	5	6	7	8	9	--3 Mil. 456 Th. 789
			4	5	6	7	8	9	——-456 Th. 789
				5	6	7	8	9	———56 Th. 789
					6	7	8	9	————6 Th. 789
						7	8	9	———— 789
							8	9	———— -89
								9	———— 9

Over-againſt every place of the Numbers in the foregoing Table is written (in words at length) the value thereof; *viz. Units*, *Tens*, *Hundreds*, *Thouſands*, &c. which words being perfectly gotten by heart, and well

well understood, the Learner will be thereby enabled to express or write down the value of any Number proposed.

And on the right hand of the Table over-against every Number therein contained, you have direction how to read, or express those Numbers: As, 987654321 is thus to be read, *viz. Nine hundred eighty seven Millions, six hundred fifty four thousand, three hundred twenty one.* And the like is to be understood of the rest.

Although the foregoing Table be made to consist but of Nine places, yet it may be continued to more places at pleasure, even *ad infinitum*, observing that the value of every place is ten times as much as that which goeth before it; so the tenth place is *thousands of Millions*, the eleventh place is *tens of thousands of Millions*, the twelfth place is *hundreds of thousands of Millions*, and the thirteenth place is *Millions of Millions*, &c. *Note.*

There is yet another Method used by some that is very plain and useful in the expressing of great Numbers, or Numbers consisting of many places, which is this, *viz.* make a point after every third figure, beginning at the right hand as in the following Example.

Let this Number be proposed consisting of fourteen places, *viz.* 84639042724536,

and when every third figure is pointed it will be thus, *viz.* 84.639.042.724.536 every three figures being called a period and are reckoned in order from the right hand towards the left, *viz.* 536 is the firſt Period, 724 is the ſecond Period, 042 the third, *&c.* the firſt period (which is 536) conſiſteth of *units*, *tens*, and *hundreds*, and is thus expreſſed, *viz. five hundred thirty ſix*, and every other Period is to be read in every reſpect as if it ſtood in the place of the firſt period, only in expreſſing the value of the ſecond period, you muſt add thereto the word *thouſand*; to the third period you muſt add the word *Millions*; to the fourth period the word *thouſands*; to the fifth period *Millions of Millions*, and ſo the Number before propoſed is to be read as followeth, *viz.*

Mil. of Mil. *Thouſand* *Millions* *Thouſands*

84. 639. 042. 724. 536

Eighty four *Millions of Millions*, ſix hundred thirty nine *Thouſand*, forty two *Millions*, ſeven hundred twenty four *Thouſands*, five hundred thirty ſix.

CHAP.

CHAP. II.

Of ADDITION.

I. *ADDITION* Teacheth to add; or put together divers Numbers, and to bring them to one total Sum. As if 7 and 9 were given to be added together, their ſum will be 16; and the ſum of 5 and 4 is 9.

II. Numbers to be added together each of them conſiſt either of one denomination or of divers, as if it were required to add 16 *l.* to 14 *l.* here both the given Numbers are of one Denomination, being Pounds only, without Shillings, Pence or Farthings: But if it were required to add 36 *l.*-14 *s.*-08 *d.* to 16 *l.*-12 *s.*-06 *d.* theſe conſiſt of divers denominations, *viz.* of Pounds, Shillings and Pence.

III. When it is required to add together ſeveral Numbers of one denomination, they muſt (in order to the work) be diſpoſed of according to the following

Rule.

Let the given Numbers be placed the one under the other in ſuch order that units may ſtand under units, tens under tens, hundreds under hundreds, thouſands under thouſands, *&c.*

Example.

Let it be required to add 136 and 42 together, they muſt be placed one under the other as followeth, *viz.*

Thus,	Or Thus,
136	42
42	136

IV. Having placed the given Numbers as before is directed, then draw a ſtreight line under them, and (beginning at the place of units) add all the figures together that ſtand over one another in that Rank, putting their Sum under the ſaid ſtreight line; As in this example I ſay, 2 and 6 is 8, wherefore I put 8 under the line, in its proper place, *viz.* under 2 and 6, and proceed to the next Rank which is the place of Tens, ſaying, 4 and 3 is 7, wherefore I put 7 in its proper place under the line; and proceed

to

to the next and laſt Rank, where I find only 1, wherefore I put 1 in its proper place under the line, and ſo the work is finiſhed, and I find thereby that the Total ſum of 136 and 42 to be 178; See the operation as followeth.

136	42
42	136
178	178

V. If in adding together any of the Ranks (as is before directed) their ſum amounts to, or exceedeth 10, or any number of tens, then in ſuch caſe you are either to ſet down a Cypher under the line in its proper place, or elſe the exceſs above the ten or tens; and for every ten carry an unit to be added to the next Rank of figures. As if it amount to 30, then ſet down (0) a Cypher, and carry 3 (for the three tens) to be added to the next Rank; if it amount to 34, then ſet down 4 under the Rank that you added, and carry 3 to the next, *&c.* And when you have caſt up the laſt Rank or Series towards the left hand, ſet down the total that it amounteth to, as in the following Examples.

(1)	(2)	(3)	(4)
748	4758	1648	20864
364	6473	3472	78987
296	2894	1865	6217
242	1862	3479	4320
Sum 1650	15987	10464	110388

In the first of these Examples I begin saying, 2 and 6 is 8, and 4 is 12, and 8 makes 20, which is just 2 tens; wherefore I put down 0, under the line and carry 2 to the next Rank for the 2 Tens, and proceed saying 2 that I carry and 4 is 6, and 9 is 15, and 6 is 21, and 4 is 25, which is 5 above 20, wherefore I put down 5 under the line, and carry 2 for the two Tens to the next Rank, and then proceed, saying, 2 that I carry and 2 is 4, and 2 is 6, and 3 is 9, and 7 makes 16, wherefore (because it is the last Rank) I put down 16 under the line, and so the work is finished, the total Sum of that Addition being 1650: The same is to be observed in the rest of the Examples.

Addition

Addition of Money.

Note here, That 4 *Farthings is a Peny,* 12 *Pence is a Shilling, and* 20 *Shillings is a Pound* Sterling, *or* Engliſh *Money.*

The following Table ought to be got by Heart.

Pence		Shill.	Pence
20		1	08
30		2	06
40		3	04
50		4	02
60		5	00
70	is	5	10
80		6	08
90		7	06
100		8	04
110		9	02
120		10	00

The uſual marks of *Engliſh* Money are as follow, *viz.* Pounds (lb.) Shillings (s.) Pence (d.) and Farthings (q.).

VI. When it is required to add together Numbers conſiſting of divers Denominations, you are to place the given Numbers in ſuch order one under the other that each Rank may

may consist of one and the same denomination, That is to say if it be in Money, Let Pounds be set under Pounds, Shillings under Shillings, Pence under Pence, and Farthings under Farthings, The like is to be understood of *Weight*, *Measure*, *Time*, &c.

Then (having first drawn a Line under them) add them together considering how many of each smaller denomination make an unite of the next that is superiour to it, (always observing to begin at the least denomination) and for every such unit carry 1 to the next superiour denomination, *viz.* If it be in Addition of Money, for every 4 in the Farthings you must carry 1 to the Pence (because 4 Farthings is a Peny); For every 12 in the Pence, carry 1 to the Shillings (because 12 Pence is a Shilling); and for every 20 contained in the Shillings, carry 1 to the Pounds (because 20 Shillings is a Pound); And the odd Farthings, Pence and Shillings set down in their proper Ranks under the Line, as in the following Example.

Let it be required to add together 134 *l.*-16 *s.*-08 *d.*-1 *q.* and 286 *l.*-10 *s.*-04 *d.*-3 *q.* and 498 *l.*-13 *s.*-06 *d.*-2 *q.* and 794 *l.*-18 *s.*-09 *d.*-1 *q.* Then in order to the work I set them down and draw a line under them as followeth.

134

lb.	s.	d.	q.
134—	16—	08—	1
286—	10—	04—	3
498—	13—	06—	2
794—	18—	09—	1

First, I begin with the leaſt denomination which is that of Farthings, and add them together, ſaying, 1 and 2 is 3, and 3 is 6, and 1 is 7 Farthings which is 1 peny and 3 Farthings, wherefore I put 3 farthings under the Line, and under the Denomination of Farthings, and carry 1 (for the peny) to the next denomination of Pence, ſaying; 1 that I carry and 9 is 10, and 6 is 16, and 4 is 20, and 8 is 28, now 28 Pence is 2 Shillings 4 pence, wherefore I put 4 under the Line, and carry 2 ſhillings to the denomination of ſhillings, ſaying 2 that I carry and 18 is 20, and 13 is 33, and 10 is 43, and 16 is 59 ſhillings, which is 2 Pounds 19 ſhillings, wherefore I put the 19 ſhillings under the Line, and under the denomination of ſhillings, and carry 2 (for the 2 pounds) to the denomination of pounds, and proceed ſaying, 2 that I carry and 4 is 6, and 8 is 14, and 6 is 20, and 4 makes 24, wherefore I put down 4 under the Line and carry 2 for

for the two tens to the next Rank, saying, 2 that I carry and 9 is 11, and 9 is 20, and 8 is 28, and 3 is 31, which is 1 above 30, wherefore I put 1 under the line and carry 3 (for the 3 tens) to the next Rank, and proceed, saying, 3 that I carry and 7 is 10, and 4 is 14. and 2 is 16, and 1 is 17, wherefore I put 17 under the line becauſe it is the Sum of the laſt Rank, and ſo the whole work is finiſhed, and I find the ſum of the given Numbers to be 1714 *l.*—19 *s.*—04 *d.*—3 *q.* as by the following work appeareth.

	l.	*s.*	*d.*	*q.*
	134—	16—	08—	1
	286—	10—	04—	3
	498—	13—	06—	2
	794—	18—	09—	1
Sum	1714—	19—	04—	3

Here Note once for all, that whatſoever Sums you are to add together, whether of Money, Weight, Meaſure, Time, *&c.* That when you come to the greateſt denomination, as you caſt up the ſeveral Ranks thereof, you are to carry the Tens of every preceding Rank, to that which follows it, as is directed in the fifth Section of this Chap-

Chapter, and as the Ranks in the Denomination of Pounds in the laſt Example are caſt up.

But there is another Method that I will commend to you for eaſe and diſpatch in caſting up your ſhillings and pence, and that is this. Firſt caſt up the place of Units in the pence or ſhillings, and then come down again with the Tens; and you may readily know how many ſhillings your pence amount to, by ſuch a Table as before I adviſed you to get by heart. An Example will make this plain, which let be as followeth, *viz.*

Let it be required to add theſe ſeveral Numbers together, *viz.* 347*l.*-15*s.*-11*d.*-2*q.* and 493*l.*-12*s.*-10*d.* and 84*l.*-19*s.*-09*d.*-1*q.* and 68*l.* 09*s.*-11*d.*-3*q.*

Now in Order to the Work I place them down one under the other as is before directed, and draw a line under them as you ſee in the Margent: Then I begin with the Farthings, ſaying 3 and 1 is 4, and 2 is 6 farthings, which is 1 peny 2 farth. wherefore I put 2 farthings, under the line, and carry 1 (for the peny) to the pence, then

l.	*s.*	*d.*	*qr.*
347	15	11	2
493	12	10	0
84	19	09	1
68	09	11	3
994	18	06	2

I pro-

I proceed to caſt up the pence, beginning with the place of Units therein, ſaying, 1 that I carry and 1 is 2, and 9 is 11, and 1 is 12, then I come down again with the place of tens, where every 1 is 10, ſaying, 12 and 10 is 22, and 10 is 32, and 10 is 42; now I know by the ſaid Table that 40*d.* is 3*s.*-4*d.* therefore 42*d.* is 3*s.*-06*d.* wherefore I put down 6*d.* under the line and carry the 3*s.* to to the ſhillings, ſaying, 3 that I carry and 9 is 12, and 9 is 21, and 2 is 23, and 5 is 28, (and coming down again with the tens,) and 10 is 38 and 10 is 48 and 10 is 58 ſhillings, which is 2*l.*-18*s.* wherefore I put down 18*s.* under the line, and carry the 2*l.* to the Pounds, and ſo finiſh the work as is before directed, and the total Sum I find to be 994*l.*-18*s.*-06*d.* 2 *qrs.* as by the Work appears.

I ſhall explain this Rule by one Example more and that ſhall be in

Addition of Troy Weight.

Note that 24 Grains is a Penny-weight, 20 Penny-weights is an Ounce, and 12 Ounces is a Pound *Troy weight.*

The Notes or Characters by which *Troy weight* is known are theſe, *viz.* The Mark of Pounds is (℔.) of Ounces (*oz.*) of Penny-weights (*pw.*) of Grains (*gr.*) Let

Let it be required to add the following particulars together, *viz.* 24℔.-09*oz.*-06*pw.*-11*gr.* and 164℔.-10*oz.*-14*pw.*-18*gr.* and 82℔.-7*oz.*-17*pw.*-20*gr.* and 8℔.-11*oz.*-18*pw.*-22*gr.*

Now in order to find out the ſum of theſe given Quantities, I place them one under the other orderly, as you ſee in the Margent, and draw a line under them. Then I begin with the Denomination of Grains, making a prick with the Pen at every 24 for eaſe, and bear the overplus to the next above, ſaying, 22 and 20 is 42 which is 18 above 24, wherefore I make a Mark at 20, and carry the 18, up higher, ſaying 18 and 18 is 36, which is 12 above 24, wherefore I make a Mark at 18, and carry the 12 to the next above, ſaying 12 and 11 make 23, which I put under the line in its proper place, and obſerve how many Pricks I have made in caſting up this Denomination which I find to be 2, wherefore I carry 2 to the next, and proceed (as in the ſhillings in *Addition of Money*, becauſe I carry 1 forevery 20) ſaying, 2 and 8 is 10, and 7 is 17,

℔	*oz.*	*pw.*	*gr.*
24	09	06	11
164	10	14	18
82	07	17	20
8	11	18	22
281	03	17	23

17, and 4 is 21, and 6 is 27, and (then down again with the Tens) 10 is 37, and 10 is 47, and 10 is 57 Penny-weights, which is 2*oz.* 17*pw.* wherefore I put 17 *pw.* in its place under the line, and carry the 2*oz.* saying 2 that I carry and 1 is 3, and 7 is 10, and 9 is 19, and 10 is 29, and 10 is 39 Ounces, which is 3℔.-3*oz.* wherefore I put the 3 Ounces in its proper place under the line, and carry the 3℔. to the Pounds, and proceed to finish the work as before is directed, which being done I find the total Sum to be 281℔.-3*oz.*-17*pw.*-23*gr.* as in the Margent.

More Examples for Practice follow

Addition of Money.

l.	*s.*	*d.*	*qr.*
479	14	10	2
164	10	09	1
375	09	05	3
64	17	11	1
38	15	08	0
67	00	10	3
£1190	09	07	2

l.	*s.*	*d.*	*qr.*
938	12	04	3
643	14	11	2
749	08	10	3
175	18	07	0
368	06	10	1
85	14	09	0
2961	16	05	1

Addition of Troy Weight.

lb.	oz.	pw.	gr.	lb.	oz.	pw.	gr.
379	05	14	18	297	10	07	13
168	11	17	14	768	09	14	06
794	09	10	22	635	11	18	21
634	10	18	20	74	08	18	19
75	06	11	15	35	10	14	14
34	00	06	16	24	06	16	18
2083	09	00	09	1837	10	10	19

Addition of Averdupois Weight.

Note that 16 Drams is an Ounce, 16 Ounces is a pound, 28 pounds is a Quarter of an Hundred, 4 Quarters is an Hundred weight consisting of 112 pounds, and 20 Hundred is a Tun *Averdupois weight.*

The Marks or Characters by which this weight is known or expressed are these, *viz.* For *Tuns* (*T.*) *Hundreds* (*C.*) *Quarters* (*Qr.*) *Pounds* (lb.) *Ounces* (*oz.*) *Drams* (*dra.*) As in the following Examples.

T.	*C.*	*qr.*	*lb.*	*T.*	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
479	14	1	17	136	09	2	15	11	10
86	17	3	25	348	18	3	17	14	13
34	09	2	15	67	12	2	18	09	14
168	12	0	00	46	16	0	12	00	12
44	13	1	14	39	08	1	14	10	15
26	16	3	18	69	19	3	13	14	07
741	04	1	05	709	05	2	08	14	07

With *Troy weight* are weighed Bread, Gold, Silver, and Electuaries. And with *Averdupois weight* are weighed Butter, Cheese, Flesh, Wax, Tallow, Pitch, Rozen, Lead, Iron, all sorts of Grocery Wares, and all such kind of garble whence there may issue a waste.

The pound *Averdupois* containing 16 Ounces, is equal to 14*oz.* 12*pw.* *Troy weight*. And the pound *Troy weight* consisting of 12 Ounces is about 13 Ounces 2 Drams and an half of *Averdupois weight*, so that he who tells you a pound of bread is as heavy as a pound of Cheese is very much mistaken, the one being a pound *Troy*, and the other a pound *Averdupois weight*.

Wool is also weighed with *Averdupois weight*

weight, but the Diviſions are ſomewhat different, *viz.*

7 Pounds is a Clove, 2 Cloves is a Stone, 2 Stone is a Todd, 6 Todds 1 Stone, or 12 Stone is a Wey, 2 Weys is a Sack, and 12 Sacks is a Laſt of Wool.

Note that according to the foregoing Diviſion 182 ℔. is a *Wey*, but in ſome Countries the *Wey* is 256 ℔. *Averdupois*, as in *Suffolk*, &c. And in *Eſſex* there is 336 ℔ in a *Wey*.

Addition of Apothecaries Weights.

Apothecaries weights are the ſame in the main with *Troy weight*, only the Subdiviſions of the pound are different as followeth, *viz.*

Note that 20 Grains is a Scruple, 3 Scruples is a Dram, 8 Drams is an Ounce, and 12 Ounces is a Pound weight. The Marks or Characters by which Apothecaries weights are known are theſe, *viz. For Pounds* (℔.) *Ounces* (ℨ.) *Drams* (ʒ.) *Scruples* (℈.) *and Grains* (gr.)

lb.	ʒ.	ʒ.	℈.	gr.
76	09	2	0	15
54	10	5	2	17
68	11	7	1	13
28	04	4	1	12
16	10	0	2	18
35	06	1	0	14
281	04	6	1	09

lb.	ʒ.	ʒ.	℈.	gr.
54	10	5	1	16
65	08	1	1	13
26	05	6	0	15
48	07	7	2	13
27	06	4	0	17
38	11	5	0	14
262	02	6	2	08

Addition

Addition of Liquid Meaſure.

The leaſt Denomination in Liquid Meaſure is a Pint, which was heretofore deduced from a *Pound* Troy weight, a pound of Wheat Troy weight making a pint Liquid Meaſure, but in regard of the diſagreement thereof with the Rules of Solid Geometry in the gauging of Brewers Veſſels, ſome taking 288 ſolid Inches for a Gallon, ſome 286, *&c.* it occaſioned a difference between the Brewers and the Managers of His Majeſties Exciſe, till the Parliament taking the matter into Conſideration ſtated the difference between them, the Statute ordaining 231 ſolid Inches to make a Gallon Wine Meaſure, and 282 ſolid Inches in a gallon Beer Meaſure, and the gallon being ſubdivided into 2 pottles, each pottle into 2 quarts, and each quart into 2 pints, ſo that the pint being the eighth part of a gallon muſt contain 28 ſolid Inches and 7 eighth parts of an Inch for Wine meaſure, and 35 ſolid Inches and a quarter for Beer Meaſure. *Wherefore note that* 35 ¼ *ſolid Inches make a pint Beer Meaſure, 2 pints is a quart, 2 quarts is a pottle, 2 pottles is a gallon, 8 gallons is a firkin of Ale, 9 gallons is a Firkin,*

kin of Beer, 2 firkins is a Kilderkin, and 2 Kilderkins is a Barrel.

In Wine Measure.

$35\frac{7}{8}$ *solid Inches is a Pint, 2 pints is a Quart, 2 quarts is a Pottle, 2 pottles is a Gallon, 42 gallons is a Terce, or third part of a Pipe or Butt, 63 Gallons is a Hogshead, 2 hogsheads is a Pipe or Butt, and 2 pipes or butts is a Tun of Wine.*

Examples of Wine Measure.

T.	*hhds.*	*gal.*	*pts.*
37	3	18	5
48	2	24	0
67	1	20	6
38	2	17	7
79	0	47	3
64	1	52	4
335	3	55	1

T.	*hhds.*	*gal.*	*pts.*
240	1	48	3
196	3	22	1
97	3	51	5
85	2	17	6
43	0	25	0
93	1	38	5
757	1	14	4

Addition of Dry Measure.

The leaſt Denominative part of dry meaſure is a pint, which is taken from *Troy weight*.

With

With these are measured all dry substances, as Corn, Salt, Coal, Sand, *&c.* the Table followeth.

In Dry measure, Note that 2 *Pints make a Quarts*, 2 *Quarts a Pottle*, 2 *Pottles a Gallon*, 2 *Gallons a Peck*, 4 *Pecks a Bushel Land measure*, 5 *Pecks a Bushel Water measure*, 8 *Bushels a Quarter*, 4 *Quarters a Chalder*, *and* 5 *Quarters a Wey.*

Examples of Dry Measure.

Chald. qrs. bush. pec.	*Chald. qrs. bush. pec.*
148—3—6—3	227—1—5—0
375—1—7—2	742—3—7—1
296—2—4—3	148—2—4—1
128—1—5—0	97—2—6—3
94—0—5—2	48—0—3—0
38—2—4—3	62—3—1—1
1082—1—2—1	1327—2—3—2

Addition of Long Measure.

Long Measure is Originally deduced from a Barley Corn taken out of the middle of the Ear and well dried, from whence is deduced the following Table, *viz.*

In Long Measure, Note that 3 *Barley Corns make an Inch*, 12 *Inches a Foot*, 3 *Foot a Yard*, 3 *Foot* 9 *Inches*, *or a Yard and Quarter is an Ell* Englisſh, 6 *Feet a Fathom*, 5½ *Yards and an half*, *or* 16 *Feet and an half make one Statute Pole*, *or Perch*, 40 *poles or perches make a Furlong*, *and* 8 *furlongs make an* Englisſh *Mile*.

Examples of Long Measure.

Miles	*Fur.*	*Perch*	*Miles*	*Fur.*	*Perch*
48	7	24	134	3	18
37	3	18	342	4	24
65	5	28	179	5	16
36	4	30	84	0	25
107	0	37	76	7	27
205	6	17	84	2	13
501	4	34	902	0	03

Addition of Cloth Measure.

From the foregoing Table of Long Measure is derived Cloth Measure; The Yard, as likewiſe the Ell being divided into 4 Quarters, and each Quarter into 4 Nails.

Examples

Examples of Cloth Measure.

yds qrs. na.	*Ells qrs. na.*	*yds qrs. na.*
137—3—3	376—2—0	184—1—2
295—1—2	178—3—3	357—3—1
112—2—3	742—3—1	475—2—2
215—0—1	97—2—2	251—1—0
174—1—2	84—1—2	164—0—2
764—3—0	68—0—3	87—1—3.
1700—0—3	1548—1—3	1520—2—2

Addition of Land Measure.

From the foregoing Table of Long Measure, is all superficial Measure deduced, that of Land Measure being as followeth, *viz.*

In Land Measure 40 square Poles or Perches make a Rood, and 4 Roods make an Acre.

Examples of Land Measure.

Acr. Rood Per	*Acr. Rood Per.*	*Acr. Rood Per.*
120—2—34	164—1—20	320—3—10
275—3—14	130—3—25	180—1—19
162—1—35	644—2—17	672—3—28
98—2—20	563—0—24	191—0—12
47—3—30	372—3—18	634—1—15
64—1—15	140—1—26	87—2—14
769—3—28	2016—1—10	2087—0—18

Of Time.

The Denominative parts of Time are originally deduced from the Suns Motion in the Heavens, which is carried round the same from *East* to *West* by the Rapid Motion of the *Primum Mobile* in one day Natural, which day is divided into 24 supposed equal parts called Hours, and each Hour is subdivided into 60 Minutes, *&c.* whence ariseth the following Table, *viz.*

In *Time*, Note, That 60 *Minutes make an Hour*, 24 *Hours make a Natural Day*, 7 *Days make a Week*, 4 *Weeks make a Month consisting of* 28 *Days*, 13 *Months* 1 *Day and* 6 *Hours make a Year.* How-

However in the ordinary Computation of Time the year is divided into 12 unequal Calendar Months, whose names, and the number of dayes that each containeth are as followeth, *viz.*

January	Hath	31	Dayes.
February		28	
March		31	
April		30	
May		31	
June		30	
July		31	
August		31	
September		30	
October		31	
November		30	
December		31	

Note that the odd 6 Hours is reckoned but once in 4 years, and then one whole day is added to that year, making it consist of 366 dayes, and is called *Leap-Year*; the said day is added to *February*, which then containeth 29 dayes.

Note also, that the Minute is usually subdivided into 60 Seconds, and each Second into 60 Thirds, *&c.*

The Tropical Year by the Observations of the most Accurate Astronomers is found

to consist of 365 Dayes, 5 Hours, 49 Minutes, 4 Seconds, and 21 Thirds.

See more of this in *Reduction* of *Time.*

The Proof of Addition.

VII. To prove the work of Addition, draw a line with the Pen under the uppermost number, and then add together all the other numbers, except that uppermost number, and when you have so done, add the amount or sum thereof to the said uppermost number, and if that sum be equal to the sum first found, then is the work truly performed, otherwise not.

Example.

Let us prove the first Example of the fifth Rule, where the Sum is found to be 1650, to do which first I draw a line under the uppermost number, which is 748, and having added the rest together, I find their sum to be 902, which I add to the uppermost number which is 748, and the sum thereof amounts to 1650, which is equal to the Sum first found, wherefore I conclude the work to be right, as in the Margent.

748
364
296
242
1650
902
1650

Let

Let us likewiſe prove the firſt example of the Sixth Rule, where the Sum is found to be 1714 l. 19 s. 4 d. 3 qr. and firſt having drawn a line under the 1ſt number, I add together all the reſt, and find their Sum to be 1580 l. 2 s. 8 d. 2 qr. which being added to the ſaid uppermoſt number 134 l. 16 s. 8 d. 1 qr. their ſum is 1714 l. 19 s. 4 d. 3 qr. which is equal to the Sum firſt found, which proves the work to be true. The like of any other.

l.	s.	d.	qr.
134	16	08	1
286	10	04	3
498	13	06	2
794	18	09	1
1714	19	04	3
1580	02	08	2
1714	19	04	3

CHAP. III.

Of SUBTRACTION.

I. SUBTRACTION Teacheth to take a leſſer Number from a greater, or an equal from an equal; whereby we diſ-

cover the Remainder, Excefs or Difference.

II. In Subtraction if the Numbers given be Integers, that is confifting only of one Denomination, then place the biggeft number uppermoft, and the leffer in Order under it, *viz.* Units under Units, Tens under Tens, Hundreds under Hundreds, *&c.* And draw a line under them.

III. Then begin at the place of Units, taking the lowermoft Figure out of the uppermoft, and place the Remainder under the Line, then proceed to the place of Tens, and do in the fame manner, and then to the place of Hundreds, *&c.* till the whole work be finifhed; Then fhall the Number under the faid Line be the Remainder or Difference.

Example. Let it be Required to find the difference between 48 and 16?

First, I put down the biggeft number 48, and place 16 the leffer number under it, and under both I draw a line as you fee in the Margent, then I begin at the place of Units, faying 6 out of 8 and there Remains 2, which I place under the Line, and proceed to the next place, faying, 1 from 4 and there remains 3, which I likewife place under the line, and the work is finifhed. So that I find the

48
16
32

the Remainder or difference between 48, and 16 to be 32, as you may see by the work in the Margent.

More Examples of the like nature follow.

From	743	585	3785	1842
Subtr.	121	270	205	342
Remains	622	316	3580	1500

But if the particular figure which you are to Subtract be greater than the figure out of which it is to be Subtracted, then you are to borrow 10 and add it to the uppermost Figure, and then Subtract the said lowermost Figure from their Sum, and place the Remainder underneath the Line, and for that which you borrowed add 1 to the next Figure in the lowermost Line, and proceed. Let this be repeated as often as there is occasion.

Example. Let it be required to Subtract 28 from 46, and to find the remainder?

First, I put down 46 (the biggest number) and underneath it I put 28 (the least num-

46
28

18

number) and under all I draw a Line, as you see in the Margent. Then I begin, saying, 8 out of 6 I cannot, but (adding 10 to the 6) 8 out of 16 and there remains 8, which I place under the line, and proceed, saying, 1 that I borrowed and 2 is 3 from 4, and there remains 1, which I place under the line, and so the work is finished, and I find the difference between 46 and 28, to be 18, as appears by the work in the Margent.

Example. 2. Let it be required to Subtract 4786 from 7324, and to find the remainder?

First, I place the given Numbers according to the Directions given in the second Rule, and as you see in the Margent. Then I begin at the place of Units, saying, 6 from 4 I cannot, but (adding 10 to the 4) 6 from 14 and there remains 8, which I place under the Line, and proceed to the next Figure, saying, 1 that I borrowed and 8 is 9 from 2 I cannot, but (adding 10 to it) 9 from 12, and there remains 3, which I put likewise under the line, and proceed to the next Figure, saying, 1 that I borrowed and 7 is 8, from 3 I cannot, but 8 from 13 and there remains 5, which I put

7324
4786

2538

put under the line, and proceed to the next, ſaying 1 that I borrowed, and 4 makes 5, from 7 and there remains 2, which I place under the line, and ſo the work is finiſhed, and I find the remainder to be 2538, as appears by the work in the Margent.

Example 3. Let it be required to Subtract 3872 from 43758.

The given Numbers being placed, and a line drawn under them, as is before directed, I begin at the Right Hand, ſaying, 2 from 8 and there remains 6, which I ſet under the line, and proceed, ſaying, 7 from 5 I cannot, but 7 from 15 and there remains 8, which I put under the line, and proceed to the next, ſaying, 1 that I borrow'd and 8 is 9 from 7 I cannot, but 9 from 17 and there remains 8, which I put under the line, and proceed to the next Figure, ſaying 1 that I borrowed and 3 is 4 from 3 I cannot, but 4 from 13 and there remains 9, which I put under the line, now becauſe there is no Figure ſtanding under the 4, I therefore ſuppoſe a (o) Cypher to be placed there, and becauſe I borrowed 1 at the laſt Figure, therefore I pay it here by Subtracting it out of the 4, ſaying, 1 that I borrowed out of 4 and there remains

43758	
3872	
39886	

remains 3, which I put under the line, and the work is finiſhed; and I find (after the work of Subtraction is ended) the remainder to be 39886; Theſe Examples being well underſtood will render what follows to be plain and eaſie.

Other Examples for Practice follow.

From	7458	50876	10008576
Subtr.	467	947	8743
Remains	6991	49929	9999833

IV. If the given Numbers conſiſt of divers Denominations, ſuch as Money, Weight, Meaſure, Time, *&c.* Then you are to place the leſſer Number under the greater, in ſuch ſort that each Denomination may ſtand under its correſpondent Name, as has been directed in *Addition*, and draw a line under them.

Then proceed to Subtract the undermoſt from the uppermoſt, beginning at the leaſt Denomination, and proceeding gradually towards the Left hand, ſetting the Remainder of each Denomination under the line until the whole be finiſhed; As for *Example.*

Let it be required to Subtract 126*l.*-07*s.*-04*d.*-1*qr.* from 254*l.*-13*s.*-10*d.*-3*qr.* firſt I place

I place them down the leſſer under the greater, and draw a line under them as you ſee in the Margent.

Then I begin at the Right hand ſaying, 1 Farthing from 3 Farthings, and there remains 2, which I put under the line in the place of Farthings, and proceed to the Denomination of Pence ſaying, 4 from 10 and there remains 6, which I put under the line in the place of Pence, and then I go to the Denomination of Shillings, ſaying, 7 from 13 and there reſts 6, which I put under the line in the place of Shillings, and then I proceed to finiſh the Work according to the third Rule of this Chapter, which being ended I find the Remainder to be 128*l.*-06*s.*-06*d.*-2*qr.* as you ſee in the Margent.

l.	*s.*	*d.*	*qr.*
254	13	10	3
126	07	04	1
128	06	06	2

V. But if the lowermoſt Number in any of the Denominations chance to be greater than the uppermoſt, you muſt in ſuch caſe borrow an Unit from the next greater Denomination, Subtracting the loweſt Number there-from, and adding the Remainder to the ſaid uppermoſt Number, and place that Sum under the line; and then proceed adding 1 to the next lowermoſt Number to the Left hand for that you borrowed, *&c.*

A few

A few Examples will make this Rule very plain Let it be required to subtract 178*l.*15*s.*9*d.* 1*qr.* from 348*l.*12*s.*7*d.* 3*qr.* first I place them down in order as has been before directed, & draw a line under them.

l.	*s.*	*d.*	*qr.*
348	12	07	3
178	15	09	1
169	16	10	2

Then I begin at the Right hand with the denomination of Farthings, saying 1 from 3 and there remains 2, which I put under the line, and proceed to the Denomination of Pence, saying, 9 pence out of 7 pence I cannot, but (borrowing 1 from the next Denomination which is Shillings and makes 12 pence I say) 9 from 12 and there remains 3, which I add to the 7 pence and that makes 10 pence, wherefore I put 10 pence under the line, and proceed to the next Denomination which is Shillings, and say 1 that I borrowed and 15 is 16 from 12 I cannot, but (borrowing 1 Pound from the next Denomination which is 20 Shillings) 16 from 20 and there remains 4, which added to the said 12 makes 16 shillings, which I set down under the line, and proceed to the Pounds, saying, 1 that I borrowed and 8 is 9 from 8 cannot, but 9 from 18, *&c.* And the Work being finished, I find the Remainder to be 169*l.*-16*s.*-10*d.*-2*qr.* as appears by the Work in the Margent.

Example.

Example 2. Another Example of *Troy weight* may be this, *viz.* Let it be required to Subtract 48℔.-09oz.-13*pw.*-19*gr. Troy weight* from 126℔.-04oz.-17*pw.*-14*gr.*?

In order to the work I disposе of the given Numbers according to the directions of the Fourth Rule foregoing, drawing a line under them as you see in the Margent.

Then I begin at the right hand which is grains, saying, 19 from 14 I cannot, but 19 from 24 (borrowing 1 peny weight which is 24 grains) and there remains 5 and 14 is 19, wherefore I put 19 under the Line, in the place of grains, and proceed to the peny weights, saying, 1 that I borrowed and 13 makes 14 from 17, and there rests 3, which I put under the line in the place of peny weights, and proceed to the Ounces, saying 9 from 4 I cannot, but 9 from 12, and there rests 3, which added to the 4 in the uppermost line makes 7, wherefore I put 7 under the line in the place of Ounces, and proceed to the Pounds, saying 1 that I borrowed and 8 is 9 from 6 I cannot, but 9 from 16 and there rests 7, which I put

℔.	oz.	pw.	gr.
126	04	17	14
48	09	13	19
77	07	03	19

I put under the line, and go to the next saying, 1 that I borrowed and 4 is 5 from 12 and there rests 7, which I put under the Line, and so the work is finished, and I find the remainder or difference to be 77 lb. -7 oz. 3 p.w. -19 gr. as appears by the work in the Margent.

VI. If a Sum of Money be lent, and payment thereof be made at several times in part, and you would know how much remains due, in this case you must add the several payments into one Sum, and Subtract that Sum from the Sum lent, and the remainder will shew you how much is due.

Example.

	lb.	s.	d.	qr.
Lent	4768	-17	-10	-1
Received at several Times.	347	-14	-06	-2
	785	-11	-11	-3
	128	-15	-09	-1
	420	-16	-05	-0
	124	-00	-02	-3
Received in all	1806	-18	-11	-1
Remains due	2961	-18	-11	-0

The

The Proof of Subtraction.

For proof of Subtraction add the Remainder to the Number Subtracted, and if the Sum be equal to the uppermoſt number (being the Number from whence Subtraction is made) then is the operation truly performed, otherwiſe not.

Example. Let us prove the third Example of the third Rule, where it is Required to Subtract 3872 from 43758.

The Remainder there found is 39886, which being added to 3872 (the number Subtracted) the Sum is 43758 which is equal to the uppermoſt Number, wherefore I conclude the operation to be truly performed.

From	43758
Subtract	3872
Reſts	39886
Proof	43758

Again. Let it be required to prove the Example of the Fifth Rule; where it is required to Subtract 178 l. 15 s. 9 d. 1 qr. from 348 l. 12 s. 7 d. 3 qr.

In

In this Examp. the remainder is found to be 169l. 16 s. 10 d. 2 qr. which I add to 178 l. 15 s. 9 d. 1 qr. (the number given to be Subtracted) and the Sum is 348 l. 12 s. 7 d. 3 qr. which is equal to the uppermoſt of the given numbers, wherefore I conclude the Subtraction to be truly wrought.

	l.	s.	d.	qr
From	348	12	07	3
Subtr.	178	15	09	1
Remain	169	16	10	2
Proof	348	12	07	3

Here follow other Examples in Subtraction together with their proof, for the Learners Practice.

Subtraction of Money.

	l.	s.	d.	qr	l.	s.	d.	qr
Borrowed	374	18	04	0	230	00	00	0
Paid	76	14	07	2	65	00	04	1
Rem. due	298	03	08	2	164	19	07	3
Proof	374	18	04	0	230	00	00	0

Borrowed

	l.	s.	d.	qr.	l.	s.	d.	qr.
Borrowed	3475	10	05	0	4620	00	00	0
Paid at several times.	358	14	07	2	409	09	10	0
	514	07	11	3	276	15	07	1
	294	16	09	0	195	13	11	3
	344	10	08	2	167	19	10	2
	365	15	10	1	984	16	05	1
	792	05	06	2	785	07	06	0
Paid in all	2670	11	05	2	2820	03	02	3
Refts due	804	18	11	2	1799	16	09	1
Proof.	3475	10	05	0	4620	00	00	0

Subtraction of Troy Weight.

	l.	oz.	pw.	gr.	l.	oz.	pw.	gr.
Bought	324	04	00	00	372	08	14	06
Sold	128	04	11	08	368	09	07	14
Remains	195	11	08	16	3	11	06	16
Proof	324	04	00	00	372	08	14	06

Bought

	l.	oz.	pw.	gr.
Bought	1375	04	18	07
Sold at several times.	64	07	13	10
	46	09	14	15
	68	10	09	18
	62	08	14	16
	94	11	18	17
	36	04	08	16
Sold in all	374	04	19	20
Refts unfold	1000	11	18	11
Proof	1375	04	18	07

Subtraction of Averdupois Weight.

	Tun.	C.	qr.	l.	C.	qr.	l.	oz.
Bought	46	11	1	08	386	0	17	05
Sold	18	04	3	18	86	1	09	13
Remains	28	06	1	18	299	3	07	08
Proof	46	11	1	08	386	0	17	05

I might proceed to give Examples in Subtraction of Liquid Measure, Dry Measure, Long Measure, Apothecaries Weights, Time, Motion, *&c.* but there being no more difference between the working of these and those Examples, than only observing the Tables of each, which are delivered in the second Chapter, therefore I forbear, this being sufficient for the meanest Capacity.

CHAP. IV.

Of MULTIPLICATION.

I. IN Multiplication there are always two Numbers given to find out a third, which shall contain either of the given Numbers as many times as the other containeth an Unite.

II. Of the two Numbers given the one is called the *Multiplicand*, and the other is called the *Multiplier*, and the Number found out by the operation is called the *Product*.

III

III. The *Multiplicand* is the Number given to be Multiplied, and is usually, for orders sake, the biggest of the two given Numbers.

IV. The *Multiplier* is that by which the *Multiplicand* is Multiplied, and is usually the least Number.

V. The Product is the Number produced by the Multiplication, and it containeth the *Multiplier* as many times as the *Multiplicand* containeth Unites; or it containeth the *Multiplicand* as often as the Multiplier containeth Unites.

VI. Multiplication is either Simple or Compound.

VII. Simple Multiplication is when the Multiplicand and Multiplier, do each of them consist of one single figure only: As if it were required to Multiply 4 by 3, 5 by 2, 9 by 7, *&c.* Here 3 times 4 is 12, and 2 times 5 is 10, and 7 times 9 is 63, now 12, 10, and 63, are the *Products* of each Multiplication.

VIII. All the variety of Simple Multiplication is contained in the following Table, which must be learned by heart, before the Learner can make any further progress.

Multiplication TABLE.

2 Times	2	is	4	5 Times	25
	3		6		30
	4		8		35
	5		10		40
	6		12		45
	7		14		
	8		16		
	9		18		
3 Times	3	is	9	6 Times	36
	4		12		42
	5		15		48
	6		18		54
	7		21	7 Times	49
	8		24		56
	9		27		63
4 Times	4	is	16	8 Times	64
	5		20		72
	6		24		
	7		28		
	8		32		
	9		36	9 Times 9 is	81

IX. Compound Multiplication is when the Multiplicand, or Multiplier, or both of them, do consist of Compound Numbers, that is, of more Figures or places than one.

As if it were required to Multiply 324 by 2, here the *Multiplicand* is 324, which consisteth of 3 places, and the *Multiplier* is 2.

X. When it is required to Multiply one Number by another, first set down the biggest Number for the Multiplicand, and under that the *Multiplier*, in such order as has been taught in Addition and Subtraction, *viz.* Unites under Unites, Tens under Tens, *&c.* and draw a line under them.

As if it were required to Multiply 324 by 2, I set them down as followeth, *viz.*

The Multiplicand	324
The Multiplier	2

Then I begin with the place of Unites, saying, 2 times 4 is 8, which I put under the line; then 2 times 2 is 4, which I also put under the line; and 2 times 3 is 6, which I also put under the line, and the Work is finished: So that I find 324 being Multiplied by 2 produceth 648, as by the following Work.

The

The Multiplicand 324
The Multiplier 2

The Product 648

XI. When the Product of any ſingle Figures amount to 10, or a certain number of Tens, then you are to ſet down a Cipher, and carry an Unite for every Ten to the Product of the next Figure; or if it comes to above 10, or any number of Tens, then ſet down the exceſs, and carry an Unite for every Ten, *&c.* as in the following Example.

Let it be required to Multiply 785641 by 5: The numbers being ſet down according to the Tenth Rule, I begin, ſaying, 5 times 1 is 5, which I put under the line, and proceed, ſaying, 5 times 4 is 20, wherefore I put down 0, and carry 2 for the two Tens to the next, ſaying, 5 times 6 is 30, and 2 that I carried is 32, wherefore I put down 2, and carry 3 for the 3 Tens to the next Figure, ſaying, 5 times 5 is 25, and 3 that I carried is 28, wherefore I put down 8 and carry 2 to the next, ſaying, 5 times 8 is 40, and 2 that I carry is 42, ſo I put down 2 and carry 4 to the next Figure, ſaying, 5 times 7 is 35, and 4 that

785641
5
3928205

I carried is 39, which being the last Figure, I put down 39 under the line, and so the Work is finished, and I find that 785641, being Multiplied by 5, the Product is 3928205, as appears by the whole Work in the Margent.

Note.

And here by the way, Note that Multiplication is a Compendious performance of Addition, for in the last Example, if instead of Multiplying 785641 by 5, I put down the Multiplicand 5 times in order one under the other, and add them all together, then will the Sum of them amount to the Product, that was found by the foregoing Work of Multiplication, as appears by the Work in the Margent. The same may be performed by any other Example.

785641
785641
785641
785641
785641
———
3928205
———

Other Examples of this Rule for Practice may be such as follow.

748046	570084	7115083
4	6	8
2992184	3420504	56920664

XII.

XII. When the Multiplier consists of divers places, then must there be as many particular Products as there are places therein, and for the true placing of each Product, observe to put the first Figure, or place of Unites under its proper Multiplier, and when you have done, draw a line under the whole Work, and add the several Products together, and their Sum will be the total Product required.

Example.

Let it be required to Multiply 46753 by 46.

Having placed the given Numbers in order to the work, according to the tenth Rule of this Chapter, and drawn a line under them as you see in the Margent; I begin to Multiply with the 6, saying, 6 times 3 is 18, wherefore I put down 8 under the line, and carry 1 to the next, saying, 6 times 5 is 30, and 1 that I carry is 31, *&c.* so that the Product by 6 is 280518. Then I begin with the 4, saying,

46753
46
280518
187012
2150638

saying, 4 times 3 is 12, wherefore I put down 2 (under the line, and under the Figure 4 by which I Multiply) and carry 1 for the Ten to the next, saying, 4 times 5 is 20, and 1 that I carry is 21, wherefore I set down 1, and carry 2 to the next, *&c.* and I find the single Product by 4 to be 187012, and so the Multiplication is ended: Then I draw a line under these two particular Products, and add them together in the order as they stand, and the Sum is 2150638, which is the true Product of 46753 being Multiplied by 46, that is 46 times 46753, is 2150638, and is equal to the Sum of 46753, being set 46 times one under another and added together. Behold the whole work of Multiplication in the Margent.

Example II.

Let it be required to Multiply 5800846 by 478.

First I dispose of the given Numbers in order to the operation, according to the tenth Rule foregoing.

Then

Then I begin and Multiply the whole Multiplicand by (the first Figure of the Multiplier) 8, and the Product thereof is 46406768; then I Multiply the same again by (the second Figure of the Multiplier) 7, and the product thereof is 40605922, the first Figure whereof, *viz.* 2, I place under 7, by which I Multiply. Then I proceed to Multiply by 4, and the product thence arising is 23203384; the first Figure whereof which is 4, I place under 4, by which I Multiply, and all the rest in their order, and so the whole work of Multiplication is finished. Then I draw a line under all, and add up the several products, and their Sum is 2772804388, which is the total product.

5800846	
478	
46406768	
40605922	
23203384	
2772804388	

Compendiums in Multiplication.

XIII. When there is one, or more Ciphers, in the Multiplier, between significant Figures, then you may Multiply by such significant Figures, omitting the Cipher or Ciphers, but observe to place the first Figure of each particular product in its proper place, according to the twelfth Rule foregoing, as in the following Examples.

45793	8465008
507	4006
320551	50790048
228965	33860032
23217051	33910822048

XIV. When the Multiplier consisteth of an Unite in the highest place towards the left hand, and all the rest Ciphers towards the right hand, as is 10, 100, 1000, *&c.* then is the whole work performed by annexing the Ciphers of the Multiplier to the Figures of the Multiplicand; as if it were required to Multiply 6548 by 10, if you annex one Cipher to the Multiplicand the work is done, and so 65480 is the product required. If the same were to be Multiplied by 100, the product would be 654800, if by 1000, the product would be 6548000; the like is to be observed of any other.

XV. When the Multiplier hath one or more Ciphers to the right hand thereof, then you may Multiply by the significant Figures, neglecting the Ciphers as if there were none such, then to the product you are to annex as many Ciphers as there were Ciphers in the Multiplier, then shall such number, with the

the Ciphers annexed to it, be the product required; as in the following Examples.

546735	7645932
4620	48000
1093470	61167456
3280410	305837280
2186940	
2525915700	367004736000

XVI. When the Multiplicand and Multiplier have each of them one or more Ciphers annexed to them, then in such case you may Multiply by the significant Figures of the Multiplicand and Multiplier, neglecting the said Ciphers as if there were none at all, and to the product so found, annex as many Ciphers as were before neglected both in the Multiplicand and Multiplier. See the following Examples.

58400	43879400
760	367000
3504	3071558
4088	2632764
44384000	1316382
	16103739800000

The product of the first of these Examples (without taking notice of the Ciphers at the ends of the Multiplicand and Multiplier) is 44384, to which annexing three Ciphers, being there are so many at the ends of the Multiplicand and Multiplier, makes the true product 44384000. The product of the second is 1610373898, to which annexing 5 Ciphers (for the 2 that are in the Multiplicand, and 3 in the Multiplier) makes the true product 161037398000000; the like may be observed of any other.

XVII. To Multiply any number by 5, annex a Cipher (or suppose it to be annexed) to the Multiplicand, and then begin at the left hand, and take half thereof for the product required.

Example. Multiply 7486 by 5; first I annex a Cipher thereto, and it makes 74860, then I begin to take half thereof thus, *viz.*

74860
37430

The half of 7 is 3, which I put under the line and there remains 1, which makes the next Figure 4 to be 14; then I say the half of 14 is 7, the half of 8 is 4, the half of 6 is 3, and the half of 0 is 0. All which I put under the line as in the Margent, so I find 37430 to be the product of 7486 Multiplied by 5.

Likewise

Likewise, if you would Multiply any number by 9, annex a Cipher to the Multiplicand, and then set the same number under it without a Cipher, and Subtract it therefrom, so shall the remainder be the product required.

It is necessary for all such as would be dexterous and ready at Arithmetick to learn to Multiply by these compound Numbers following very readily at one operation, viz.

Ex. Mult. 574967	Mult. 842958
by 11	by 12
fa. 6324637	*fa.* 10115496
345786	859427
110	120
product 38036460	*fa.* 103131240

Here 574967 is Multiplyed by 11 thus, 11 times 7 is 77, put down 7, and carry 7, and then 11 times 6 is 66, and 7 I carry is 73, put down 3, and carry 7, then 11 times 9 is 99, and 7 I carry is 106, put down 6 and carry 10, then 11 times 4 is 44, and 10 I carry is 54, put down 4, and carry 5, then 11 times 7 is 77 and 5 is 82, put down 2 and carry 8, then 11 times 5 is 55, and 8 I carry is 63, which put down, so the pro-

duct

duct of 574967 Mult. by 11 is found to be 6324637.

In like manner to Mult. 842958 by 12, say 12 times 8 is 6, put down 6, and carry 9, then 12 times 5 is 60, and 9 I carry is 69, put down 9, and carry 6, and so proceed till you have gone through your Sum.

To Multiply any Number by 110, or 120, put down a Cypher, and Multiply as before,

Multiply 423760	Mult. 543760
by 1100	by 1200
prod. 46613600	*fa.* 652512000

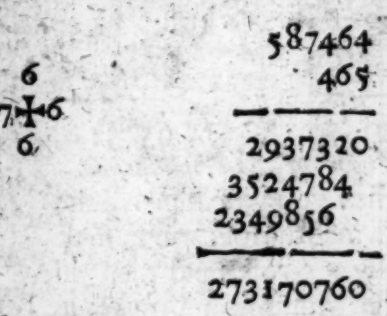
The Proof of Multiplication.

XVIII. When you would prove the truth of your work in Multiplication, first with your Pen make a Cross, and then add the Figures of the Multiplicand together, not considering their value as to the places they possess, but as if they were all Unites, casting away the Nines as often as may be, and put the last remainder on the left side of the Cross made for that purpose, then likewise add the Figures in the Multiplier together, casting away the Nines as often as may be, and put the last remainder on the right side of the Cross; then Multiply these two remainders one by another, and cast away all the Nines out of their product, and put that

remainder

remainder above the Croſs; then add together the Figures of the product, caſting away the Nines as often as may be, and put the laſt remainder under the Croſs, and then look if the Figure above the Croſs, and the Figure below the Croſs, be equal, then is your Sum rightly performed, otherwiſe not.

As for Example: Let it be required to multiply 587464 by 465; when the work is finiſhed, I find the product to be 273170760, as by the following work appears.



Now to prove whether the work be rightly perform'd, I firſt make a Croſs as you ſee above, and then begin to add the Figures of the Multiplicand together, ſaying, 5 and 8 is 13, caſt away 9 and there reſts 4; then 4 and 7 is 11, caſt away 9 and there reſts 2; then 2 and 4 is 6, and 6 is 12, caſt away 9 and there remains 3; then 3 and 4 is 7, which I put down on the left ſide of the Croſs:

Then

Then I add together the Figures of the Multiplier, as I did those of the Multiplicand, and the last remainder there is 6, which I put on the right side of the Cross; then do I Multiply these two Figures together which stand on each side of the Cross, *viz.* 6 and 7, and their product is 42, out of which I cast the Nines as often as may be, and there remains 6, which I put on the top of the Cross. But the easiest way to cast the Nines out of any Number, is to add the Figures together which constitute that Number, and their Sum is the remainder when the Nines are cast away as often as may be, so in this Example the Nines are easily cast out of 42 (which is the product of 6 by 7) for 42 is constituted of 4 and 2 whose Sum is 6; but if the said Sum chance to come to more than 9, cast 9 out of it and put down the remainder, so 8 times 7 is 56, the Sum of which Figures (5 and 6) is 11, out of which taking 9 there rests 2, which is the true remainder when the Nines are cast out of 56 as often as may be.

Now in this Example, having put the said remainder 6 above the Cross, I proceed to cast away the Nines out of the product, and there remains likewise 6, which I put below the Cross, and because the Figure above and below

below the Croſs are equal, *viz.* Each 6, I conclude the work to be truly performed.

But the true proof of Multiplication is by Diviſion, as ſhall be taught in that Rule, this way by caſting away the Nines many times proving the work to be true when it is abſolutely falſe, but when it proveth not true this way the Sum cannot be right.

Some Examples of Multiplication, with their proof for the Learners practice.

5	37486	6	6800748
1+5	275	6+4	30406
5		6	
	187430		40804488
	262402		27202992
	74972		20402244
	10308650		206783543688

0	7654879	5	86479358
1+0	369000	5+1	1000
0		5	
	68893911		86479358000
	45929274		
	22964637		
	2824650351000		

CHAP.

CHAP. V.

Of DIVISION.

I. *DIVISION* teacheth to divide any given number into as many equal parts as you pleaſe. Or,

It is that by which we diſcover how often one number is contained in another.

II. In Diviſion there are always 3 numbers certain, and a fourth accidental.

III. Of the 3 numbers certain 2 are always given to find out a third, *viz.* The one of the Numbers given is to be Divided, the other Number given is that by which the firſt is Divided, and the Number found out diſcovers how often the one Number is contained in the other.

IV. The Number given to be Divided is called the *Dividend*, and the Number given by which it is to be Divided is called the *Diviſor*, and the Number invented by the operation is called the *Quotient*, and the Number which remains after Diviſion is ended, which is uncertain, is called the *Remainder*.

Remainder. As suppose 15 were given to be divided by 3, or 15 Shillings to be Divided amongst 3 Men, here 15 is the *Dividend*, 3 is the *Divisor*, and 5 is the *Quotient*, for 3 is contained in 15 just 5 times, without any remainder; but if you were to divide 20 by 3, the *Quotient* would be 6, and the *Remainder* 2, for 3 is contained in 20, 6 times, and 2 remains over.

In Division you are first to write down the *Dividend*, and then draw a crooked line at each end thereof, one on the left hand, before which to place the *Divisor*, and another on the right hand, behind which to place the *Quotient*.

Example. Let it be required to divide 45 by 9, here the *Quotient* is 5, for 9 is contained in 45, 5 times, and these ought to be placed as followeth.

The Divisor.	The Dividend.	The Quotient.
9)	45	(5

V. When a Number is given to be divided by a single Figure or Digit, if the first Figure of the *Dividend*, *viz.* that on the left hand be bigger, or at least equal to the *Divisor*, you are to put a point or prick with the Pen under the same, and then to proceed as followeth. *Example.*

Example. Suppose it were required to divide 932 by 4: The given Numbers ought to be placed as before directed, with a prick of the Pen under the first Figure (9) of the *Dividend*, which for distinction sake may be called the *Dividual* as followeth.

4) 932 (

VI. In every *Division* you are to observe this Method, *viz.* First to seek, Secondly to multiply, and Thirdly to Subtract; then put a point under the next Figure of the *Dividend*, and annex it to the Remainder for a new *Dividual*.

So in this Example, first I seek how often 4, the *Divisor*, is contained in the Dividual 9, which I find to be 2 times, wherefore I put 2 in the Quotient, and then the Work will stand as followeth.

4) 932 (2

Then do I multiply the *Divisor* (4) by (2) the Figure in the *Quotient*, and the Product is 8, which I put under the Dividual 9, and Subtract it therefrom, and the Remainder is 1, which I put below the line, and then the work will stand as followeth.

4)

```
4) 932 (2
   8
   ---
   1
```

Then do I put a point under the next Figure in the Dividend, which is 3, and then annex it to the ſaid Remainder 1, and it makes 13 for a new *Dividual*, and then the work will ſtand as followeth.

```
4) 932 (2
   8
   ---
   13
```

Then I begin again and (repeating the direction in the ſixth Rule) ſeek how often I can have the Diviſor (4) in the *Dividual* (13,) and I find it 3 times, wherefore I put 3 in the Quotient, and then the work will ſtand thus:

```
4) 932 (23
   8
   ---
   13
```

Then

Then according to the sixth Rule, I multiply my Divisor (4) by (3) the Figure put last in the *Quotient*, and the *Product* is 12, which I place under the said Dividual 13, and then the work will stand as followeth:

```
4) 932 (23
   8
  ---
   13
   12
```

Then according to the said sixth Rule, I draw a line under 12, and Subtract it from the Dividual 13, and the Remainder is 1, which I place under the line, and then the work will stand thus:

```
4) 932 (23
   8
  ---
   13
   12
  ---
    1
```

Then I put a point under the next and last Figure of the Dividend, which is 2, and annex

nex it to the said Remainder 1, and it makes 12 for a new Dividual, and then the work will stand as followeth:

```
4) 932 (23
   8
   --
   13
   12
   --
   12
```

Then I repeat the Direction of the sixth Rule, and first seek how often I can have the Divisor 4 in the Dividual 12, and I find it 3 times, wherefore I put 3 in the Quotient.

Secondly, I multiply the Divisor 4 by the Figure (3) last put in the Quotient, and the Product is 12, which I put under the said Dividual 12, and

Thirdly, I Subtract (which is the last part of the sixth Rule) the said Product (12) from the said Dividual (12) and there remains (0.) And so the work is finished, and then stands as followeth:

```
4) 932 (233
   8
   --
   13
   12
   --
   12
   12
   --
   (0)
```

By the foregoing operation, I find that if 932 be divided by 4, the Quotient will be 233; that is, if 932 *l.* were to be divided equally between 4 men, the share of each would be 233 *l.*

VII. But if the first Figure of the Dividend towards the left hand, be lesser than the first Figure of the Divisor towards the left hand, then must you put a point under the second Figure of the Dividend, and so shall the two first Figures of the Dividend be the first Dividual, and you are to seek how often the Divisor is contained in the said Dividual.

Example 2. Let there be given 2695 to be divided by 7, or into seven equal parts, the given Numbers being placed in order to the work will stand as followeth:

7)

7) 2695 (

Firſt, I conſider that the Diviſor 7 is leſs than the firſt Figure of the Dividend, *viz.* 2. wherefore I put a point under the next Figure which is 6, ſo is 26 the firſt Dividual: Wherefore I ſeek how often the Diviſor 7 is contained in the Dividual 26, and I find it 3 times, wherefore I put 3 in the Quotient, and then multiply the Diviſor 7 thereby, and the Product is 21, which I place under the Dividual 26, and Subtract it there-from, and there remains 5, which I place under the line, and then the work will ſtand as follow-eth, *viz.*

7) 2695 (3
21

5

Then I put a point under the next Figure (9) and bringing it down annex it to the ſaid Remainder 5, and it makes 59 for a new Dividual.

Then according to the ſixth Rule, I firſt ſeek how often the Diviſor 7 is contained in the Dividual 59, and the Anſwer is 8 times, wherefore I put 8 in the Quotient, and then,

Secondly,

Secondly, I multiply the Divisor 7 by 8, that I last placed in the Quotient, and the Product is 56, which I put under the Dividual 59; and Thirdly, I Subtract it therefrom, and the Remainder is 3, which I put under the line in its proper place, and then the work will stand thus:

```
7) 2695 (38
   21
   ---
    59
    56
    --
     3
```

Then I put a point under the next and last Figure of the Dividend, which is 5, and bringing it down I annex it to the said Remainder 3, and it makes 35 for a new Dividual.

Then I again repeat the sixth Rule of this Chapter, and first seek how often the Divisor 7 is contained in the Dividual 35, and the Answer is 5 times, wherefore I put 5 in the Quotient; and secondly, thereby I multiply the Divisor 7, and the Product is 35, which I place under the Dividual 35. And thirdly, I Subtract it there-from, and there remains 0; and so the work is ended, and will then stand as followeth.

7)

```
7 ) 2695 ( 385
    21
    ---
     59
     56
     --
      35
      35
      --
       (0)
```

VIII. After the first Figure is placed in the Quotient, if it so happen (as many times it doth) that the Divisor cannot be contained in the Dividual, then you are to place a Cypher in the Quotient, and then put a point under the next Figure of the Dividend, and annex it to the said Dividual, and then you have a new Dividual to proceed upon.

Example. 3.

Let there be given 3248 to be divided by 8. First, I seek how often 8 is contained in 32, and the Answer is 4 times, wherefore I put 4 in the Quotient, and multiply the Divisor thereby, and the Product is 32, which

```
8) 3248 (406
   ...
   32
  ----
   048
    48
  ----
   (0)
```

being Subtracted from the Dividual 32, there remaineth 0, then I put a point under the next Figure of the Dividend which is 4, and annex it to the said Remainder 0, and it makes 04 for a new Dividual. Then I seek how often the Divisor 8 is contained in the Dividual 4, which I find cannot be, wherefore I put (0) a Cypher in the Quotient, and put a point under the next Figure in the Dividend which is 8, and annex it to the said Dividual 4, and it makes 48 for a new Dividual: Then I seek how often 8 is contained in 48, and the answer is 6 times, wherefore I put 6 in the Quotient, and thereby multiply the Divisor 8, and the Product is 48, which placed under the Dividual 48, and Subtracted therefrom, the remainder is 0. And so the operation is ended, and I find that 3248 being divided by 8, the Quotient is 406, as by the work in the Margent.

Other Examples for the Practice of the foregoing Rules.

(4) Example

6) 2868 (478
...
24

46
42

48
48
---
(0)

(5) Example

7) 2863 (409
...
28

063
63

•

(6) Example

8) 4688 (586
...
40

68
64

48
48

0

(7) Example

9) 360612 (40068
....
36

0061
54

72
72
---
(0)

IX. When the Diviſor conſiſteth of more places than one, then you are to ſet out ſo many on the left hand of the Dividend for a Dividual, and then put a point under that figure of the Dividual which ſtands next to the right hand.

Then ſeek how often the firſt figure towards the left hand of the Diviſor, is contained in the firſt figure towards the left hand of the ſaid Dividual, and place the anſwer in the quotient.

Then Multiply the whole Diviſor by the ſaid figure ſo placed in the quotient, and place the product in order under the Dividual.

VVhich being done ſubſtract the ſaid Product from the Dividual placing the remainder below the line.

Then put a point under the next figure of the Dividend, and annex it to the remainder, ſo have you a new Dividual, with which you are to proceed as is before directed.

Example 8. Let it be required to Divide 8904 by 42. Here the given numbers being diſpoſed of according to the 4th. Rule of this Chapter will ſtand as followeth.

42) 8904 (

Then

Then becauſe there are 2 places in the Diviſor I take the two firſt figures on the left hand of the *Dividend* for a Dividual which is 89, putting a point under the 9, which is that figure of the Dividual which ſtands next the right hand.

Then I ſeek how often the firſt Figure (4) of the Diviſor, is contained in the firſt Figure (8) of the Dividual, and the anſwer is 2 times, wherefore I put 2 in the Quotient, and thereby I multiply the Diviſor 42, and the Product is 84, which I place in order under the Dividual 89, and Subtract it therefrom, and the remainder is 5.

Then I put a point under the next place which is (0), and annex it to the ſaid remainder 5 and it makes 50 for a new Dividual, and then the work will ſtand as followeth.

42) 8904 (2

84

50

In the next place I ſeek how often I can have the firſt Figure of the Diviſor (which is 4) in the firſt Figure of the Dividual 50 (which is 5) and the anſwer is 1 time, wherefore I put 1 in the Quotient, and thereby

multiply the Diviſor 42, and the Product is 42, which I place in order under the Dividual 50, and ſubſtract it therefrom, and the remainder is 8, which I place under the line and thereto annex the next Figure of the Dividend which is 4, (having firſt put a point under it) and it makes 84 for a new Dividual, and then the work will ſtand as followeth.

42) 8904 (21
84.
50
42
84

Then I again ſeek hovv often the firſt Figure of the Diviſor (vvhich is 4) is contained in the firſt Figure of the Dividual (vvhich is 8) and the anſvver is 2 times, vvherefore I put 2 in the Quotient and thereby multiply the Diviſor 42, and the Product is 84, vvhich I place orderly under the Dividual 84, and Subtract it therefrom, and there remains 0. So is the operation ended, and I find that 8904 being Divided by 42 the Quotient is 212, as by the followving operation appeareth.

42)

42) 8904 (212
84

50
42

84
84
---
(0)

X. VVhen you have multiplied the Divisor by the Figure placed in the Quotient, if the Product chance to be greater than the Dividual, then you may be sure that the Figure placed in the Quotient is too much, vvherefore in such case you must cancel that Figure, and in the room thereof put one that is less by an unite, and if the Product be yet bigger then the dividual, place yet a lesser Figure than that in the Quotient, and then proceed as has been before directed.

Example 9th. Let it be required to divide 7868 by 37. The given numbers being placed according to former direction, I begin the vvork, and first I seek hovv often I can have 3 (the first Figure of the divisor)

in 7 the firſt Figure of the Dividual 78, (having before put a point under the 8,) and the Anſwer is 2 times, wherefore I put 2 in the Quotient, and thereby multiply the Diviſor 37, and the Product is 74, which being Subtracted from the Dividual 78, there remains 4, to which having annexed the next Figure of the Dividend (6) it makes 46 for a new Dividual. Then I proceed to ſeek how often 3 is contained in 4, and the anſwer is 1 time, wherefore I put 1 in the Quotient, and thereby multiply the Diviſor 37, and the Product is 37 which being Subtracted from the Dividual 46 the remainder is 9, to which the next Figure of the Dividend being annexed, *viz.* 8, it makes 98 for a new Dividual. Then I proceed to ſeek how often I can have 3 in 9, and the anſwer is 3 times, wherefore I put 3 in the Quotient, and thereby I multiply the Diviſor 37, and the Product is 111, which is more than the dividual, whereby I perceive that I have put a Figure too big in the Quotient, therefore according to the directions given in the foregoing Rule I cancel the 3, and in ſtead thereof I place a 2, and then multiply the Diviſor thereby, and the Product is 74 which is leſſer than the Dividual, wherefore I make Subtraction and there remains 24; and ſo having never another Figure to bring down from the Dividend I con-

I conclude the work to be ended, and the Quotient thus found is 212 as by the following operation appears.

```
                 2
37) 7868 (213
    ...
    74
    ---
     46
     37
     ---
      98
     xxx
      74
     ---
Remainder (24)
```

And here note, That if at any time it so happen that after you have multiplied the Divisor by the Figure last placed in the Quotient, and Subtracted the Product from the Dividual, if the Remainder be greater than the Divisor, the Figure last placed in the Quotient is too little, and therefore it must be cancelled, and a bigger Figure placed in its Room. What is to be done with the remainder after Division is ended shall be shewed in its due place, but only for the present let it suffice to understand that it is the Numerator of a Fraction which is part of the

Quotient, the *Divisor* being the Denominator to the same: So the true Quotient of the last *Division* is $212\frac{24}{587}$. But more of this hereafter.

XI. When (according to the directions given in the last Rule) you have assigned your Dividual to consist of as many places as the *Divisor* containeth places, if then the Dividual be less than the Divisor, (so that the Divisor cannot be Subtracted therefrom) you are then to annex another Figure thereto, so that then it will consist of one place more than the Divisor hath places, and then you are to seek how often the first Figure of your Divisor is contained in the two first Figures of the Dividend; and then proceed according to the Rules before delivered.

The like is to be observed in the middle of your work if the Dividual chance to consist of one Figure more than the Divisor, as in the following Example.

Example 10. Let it be required to divide 4763585 by 587. Here because the Divisor 587 consisteth of 3 places, therefore I should take the 3 first Figures to the left hand of the Dividend for a Dividual which is 476, but because 476 is lesser than the Divisor 587, I therefore put another Figure thereto, and then I have 4763 for a Dividual, and having

ing first put a point under the Figure 3, I begin the Division, and first I seek how often 5 (the first Figure of the Divisor) is contained in 47 (the 2 first Figures of the Dividend) which I find to be 9 times, but having tryed (according to the Tenth Rule of this Chapter) I find 9 is too much, but it will bear 8, wherefore I put 8 in the Quotient, and having multiplied the Divisor thereby, and Subtracted the Product from the Dividual according to the direction given in the Sixth Rule of this Chapter, I find the remainder to be 67, to which I annex the next Figure of the Dividend which is 5, having first put a point under it (according to the said Sixth Rule) and then I have 675 for a new Dividual. Then I seek how oft 5 (the first of the Divisor) is contained in 6 (the first of the Dividend) and the answer is 1, which I put in the Quotient, and having Multiplied and Subtracted, I find the remainder to be 88, to which annexing the next Figure in the Dividend it makes 888, for a new Dividual, then I seek, &c. And after Subtraction, there is a Remainder of 301 to which annexing the next and last Figure of the Dividend which is 5, it makes 3015 for a Dividual, which consisteth of one place more than the Divisor, therefore according to the latter part of the Eleventh Rule, I seek how often

often 5 is contained in 30, and by Trial according to the Tenth Rule, I find it will bear 5 times, wherefore I put 5 in the Quotient, and having Multiplied and Subtracted, I find the Remainder to be 80, and the work is ended, and I find the Quotient to be 8115 $\frac{80}{587}$. See the following work.

```
587) 4763585 (8115
     4696
     ----
      675
      587
      ---
       888
       587
       ---
        3015
        2935
        ----
Remainder (80)
```

Thus have I run through Division, and I hope that by this time the Learner is able to divide any Number given, and here let him take notice once for all, that there must never be brought down but one Figure or Cypher at one time from the Dividend, to be annexed to the Remainder for a new Dividual,

dual, and for every ſuch Figure or Cypher ſo brought down there muſt be a Figure or Cypher put in the Quotient.

I might give you many more Examples of Diviſion, wherein the Diviſor may conſiſt of 4, 5, 6, 7, 8, 9, 10, *&c.* places, but the method being the very ſame with what is before delivered I ſhall therefore forbear, and only admoniſh the Learner to be perfect in the foregoing Rules, and to practiſe well the Examples therein delivered, and for further practice, I ſhall lay down the operation of two other Examples, and then give you the Quotients of four other Examples, but ſhall omit the Operation as a whetſtone for the Learners Ingenuity.

Example

Example 11. Divide 48765900437 by 49765.

49765) 48765900437 (979923.

447885

397740

348355

493850

447885

459654

447885

117693

99530

181637

149295

Remainder (32342)

Example

Example 12. Divide 1489751828835 by 297546.

297546) 1489751828835 (5006795
.....
1487730

2021828
1785276

2365528
2082822

2827063
2677914

1491495
1487730

Remainder (3765).

Likewise if you divide 2459337766 by 38462, the Quotient will be 63942, and the Remainder after the work is finished is 562.

And if you divide 4926735806877 by 5846793, the Quotient will be 842639 and there will be a Remainder of 150.

Or

Or if you divide 1079245884216 by 1998573 the Quotient will be 540008, and there will be a Remainder of 475632.

Alſo if you divide 2395096414149 8 by 297864 the Quotient will be 80409063, and there will be a Remainder of 66.

The Proof of Diviſion.

XII. The certain Proof of *Diviſion* is by *Multiplication*, for if you multiply the *Quotient* by the *Diviſor*, the Product will be equal to the *Dividend*, when the work is truly performed.

And if there be any remainder after *Diviſion* is ended, you are to add that remainder to the ſaid Product, and if the Sum be equal to the *Dividend*, then is the operation rightly performed, otherwiſe not.

Let us prove the tenth Example, which is in the eleventh Rule; where it is required to divide 4763585 by 587, and the Quotient is there found to be 8115, and there is a remainder of 80 after the Diviſion is ended; to prove which I multiply the ſaid *Quotient* 8115 by the *Diviſor* 587, and the Product is 4763505, to which adding the ſaid remainder 80 the Sum is 4763585, equal to the *Dividend*, which proves the work to be right. See the whole work as followeth.

587)

```
587) 4763585      (8115
     4696           587
     ----          -----
      675          56805
      587         64920
     ----        40575
      888        -------
      587        4763505
     ----              80 Remain.
      3015       ---------
      2935       4763585 Proof.
     ----
Remainder (80)
```

Or you may take the ſeveral *Products* that are placed under each *Dividual*, and place them in the ſame order as they there ſtand in reſpect to one another, and to their Sum add the Remainder if any be, ſo ſhall the laſt Sum be equal to the *Dividend* if the work be rightly performed.

So the ſeveral *Products* being taken out of the fore-going Example, and placed the one under the other in the ſame order as they there ſtand, with the Remainder placed laſt of all, and added together the Sum is found to be 4763585; which is equal to the *Dividend*, and provesthe work to be right, as followeth.

4696

Or if you divide 10792458842 16 by 1998573 the Quotient will be 540008, and there will be a Remainder of 475632.

Alſo if you divide 23950964141498 by 297864 the Quotient will be 80409063, and there will be a Remainder of 66.

The Proof of Diviſion.

XII. The certain Proof of *Diviſion* is by *Multiplication*, for if you multiply the *Quotient* by the *Diviſor*, the Product will be equal to the *Dividend*, when the work is truly performed.

And if there be any remainder after *Diviſion* is ended, you are to add that remainder to the ſaid Product, and if the Sum be equal to the *Dividend*, then is the operation rightly performed, otherwiſe not.

Let us prove the tenth Example, which is in the eleventh Rule; where it is required to divide 4763585 by 587, and the Quotient is there found to be 8115, and there is a remainder of 80 after the Diviſion is ended; to prove which I multiply the ſaid *Quotient* 8115 by the *Diviſor* 587, and the Product is 4763505, to which adding the ſaid remainder 80 the Sum is 4763585, equal to the *Dividend*, which proves the work to be right. See the whole work as followeth.

587)

```
587) 4763585      (8115
     4696           587
     ----          -----
      675          56805
      587         64920
     ----        40575
      888        -------
      587        4763505
     ----              80 Remain.
      3015       ---------
      2935       4763585 Proof.
     ----
Remainder (80)
```

Or you may take the several *Products* that are placed under each *Dividual*, and place them in the same order as they there stand in respect to one another, and to their Sum add the Remainder if any be, so shall the last Sum be equal to the *Dividend* if the work be rightly performed.

So the several *Products* being taken out of the fore-going Example, and placed the one under the other in the same order as they there stand, with the Remainder placed last of all, and added together the Sum is found to be 4763585, which is equal to the *Dividend*, and provesthe work to be right, as followeth.

4696

4696
587
587
2935
80

Sum is 4763585 for Proof.

Or *Division* may be truly proved by *Division* thus; If there be any Remainder after *Division* is ended, subſtract it from the *Dividend*, and divide that which remaineth by the *Quotient*, and the *Quotient* thence ariſing will be equal to the given *Diviſor*, if the work be truly performed, otherwiſe not.

Example. Let us hereby prove the foregoing Example.

4763585 The Dividend.
80 The Remainder.

8115) 4763505 (587
40575
70600
64920
56805
56805
(0)

Here

Here when I have ſubſtracted (80) the Remainder from the *Dividend* 4763585 there remaineth 4763505, which being divided by the former *Quotient* 8115, the *Quotient* thence ariſing is 587, which is equal to the given *Diviſor*, and thereby the work is proved to be right. The like may be done by any other.

There is another way uſed by ſome to prove *Diviſion*, by caſting away the Nines as in *Multiplication*, but that Method being uncertain, many times proving the work to be right when 'tis wrong, I ſhall therefore paſs it by as not worthy of further notice in this place, but leave its practice to be proſecuted by thoſe who without any great reaſon admire it.

The Proof of Multiplication.

Alſo the moſt certain way of proving Multiplication is by *Diviſion*, (they interchangeably proving each other) for,

If you divide the *Product* by the *Multiplicand* the *Quotient* will be equal to the *Multiplier*, or,

If you divide the *Product* by the *Multiplier* the *Quotient* will be equal to the *Multiplicand*.

Example.

Example. Let us prove the first Example of the twelfth Rule of Chap. 4. where it is required to multiply 46753 by 46, and the Product is there found to be 2150638, now if you divide the said Product 2150638 by 46753 the Multiplicand, the Quotient will be 46, equal to the Multiplier; or if you divide the Product 2150638 by 46 the Multiplier, the Quotient will be 46753, equal to the Multiplicand; either of which prove the work to be right: See the following work.

```
46753) 2150638 (46 46) 2150638(46753
       187012          184
       ------          ---
        280518          310
        280518          276
        ------          ---
          (0)            346
                         322
                         ---
                          243
                          230
                          ---
                           138
                           138
                           ---
                           (0)
```

Compendiums

Compendiums in Diviſion.

1. When the *Diviſor* conſiſteth of an Unite with Cyphers, as 10, 100, 1000, *&c.* cut off ſo many places to the right of the *Dividend* with a daſh of the Pen, as there are Cyphers in the *Diviſor*, ſo ſhall the Figures on the left hand be the *Quotient*, and thoſe on the right hand ſhall be the Remainder after *Diviſion* is ended.

So if 48695 were given to be divided by 10, I cut off one figure with a daſh of the Pen, thus, 4869|5, ſo is 4869 the *Quotient*, and 5 is the Remainder.

In like manner if the ſame were to be divided by 100, I cut off 2 places, thus, 486|95, and then is 486 the *Quotient*, and 95 the Remainder. The like of any other.

2. When the *Diviſor* conſiſteth of any other number, with a Cypher, or Cyphers annexed thereto, then cut off the Cyphers of the *Diviſor* with a daſh of the Pen, and as many Cyphers as you cut off from the *Diviſor*, ſo many places muſt you cut off from the *Dividend*, then proceed to divide the remaining Figures of the *Dividend* by the remaining Figures of the *Diviſor*, as if there were no ſuch Cyphers or Figures in the *Diviſor* or *Dividend* as you cut off, and if nothing

thing remain after *Division* is ended, then shall the figures you cut off from the given *Dividend* be the true remainder; but if any thing do remain after *Division* is ended, you are thereto to annex the Figures of the *Dividend* that were before cut off; so shall the said remainder with the Figures annexed thereto be the true remainder.

Example. Let it be required to divide 486793 by 15000; first I cut off the 3 Cyphers of the *Divisor*, and also 3 places to the right hand of the *Dividend*, so have I 15 for my *Divisor*, and 486 for my *Dividend*, as followeth.

```
15|000 ) 486|793 (32
         45
         --
         36
         30
         --
          6
```

Here I find the *Quotient* to be 32, and the Remainder is 6, to which annexing the figures cut off from the *Dividend*, *viz.* 793 it makes 6793 for the true Remainder.

3. When the *Dividend* and *Divisor* have each of them Cyphers annexed to them, then cut

cut off an equal number of Cyphers from both, with a dash of the Pen, and then work with the remaining Figures, as if there never had been any ſuch Cyphers, nor need you make any account of them when *Diviſion* is ended, either as to the Remainder, or otherwiſe.

Example. Divide 9424000 by 24000; here I cut off 3 Cyphers from each, and then divide 9424 by 24, and the *Quotient* is $392\frac{16}{24}$, the true remainder being 16, accounting the *Diviſor* to be 24.

24|000) 9424|000 (392

72

222
216

64
48

(16)

Thus have I gone through the fundamental Rules of Arithmetick, the principal uſe of which ſhall be taught in the following Chapters.

CHAP.

CHAP. VI.

Of REDUCTION.

I. *REDUCTION* Teacheth to Reduce Numbers, whether Money, Weight, Measure, Time, Motion, *&c.* from one Denomination to another, discovering the same value, but in different Terms.

II. The whole Work of Reduction is performed by Multiplication and *Division*.

III. All great Denominations are brought into lesser of the same value by Multiplication, and this is by some called Reduction descending.

IV. All small Denominations are reduced into greater of the same value by *Division*; and this is by some called Reduction ascending.

V. To reduce greater Denominations into lesser of the same value, consider how many of the lesser are equal to one of the greater, and multiply the given number thereby, so shall the Product be the Answer to the Question.

ſtion. *Example.* Reduce into Pence. Here I conſider that 12 Pence is a Shilling, and the Pence ought to be 12 times as many as the Shillings, wherefore I multiply by 12, and the Product is 41616 Pence, as in the Margent.

3468 Shillings

3468
12
6936
3468
41616 d.

VI. To reduce ſmaller Denominations into greater of the ſame value, conſider how many of the ſmaller are equal to one of the greater, and divide thereby; ſo ſhall the Quotient be the Anſwer to the Queſtion. *Example.* Reduce 41616 Pence into ſhillings. In this Example I conſider that 12 Pence is a Shilling, and that the Shillings ought to be a twelfth part of the pence, wherefore I divide the given number by 12, and the Quotient gives me 3468 Shillings, which is the Anſwer to the Queſtion, and may ſerve for a Proof of the foregoing Example.

12) 41616 (3468
36
56
48
81
72
96
96
(0)

Reduction of Money.

For your further assistance herein you ought to have respect to the Tables of Coin, Weight, Measure, *&c.* delivered in the second Chapter.

Example I. In 685 *l.* I demand how many Shillings, Pence and Farthings?

685 Pounds
20
13700 Shill.
12
274
137
164400 Pence.
4
657600 Farth.

First I multiply by 20 (beause 20 Shillings is a Pound) and the Product is 13700 Shillings, then I multiply the Shillings by 12, (because 12 Pence is a Shilling) and the Product is 164400 Pence, then I multiply the Farthings by 4, (because 4 Farthings is a Penny) and the Product is 657600 Farthings, as *per* Margent.

This or any other number of Pounds might be reduced into Pence or Farthings at one operation, without reducing it into the intermediate Denominations.

For

For if you multiply Pounds by 240 (because so many Pence make a Pound) the Product will be Pence; and if you multiply Pounds by 960 (because 960 Farthings is a Pound) the product will be Farthings: So in the foregoing Example 685 *l.* being multiplied by 240, the product you will find to be 164400 Pence; and if you multiply 685 *l.* by 960, the product will be 657600 Farthings for the reasons before said.

But you may say you cannot well remember how many Pence or Farthings make a Pound, I will therefore teach you how to find it out at any time when you have occasion. You may easily remember that 20 Shillings is a Pound, and that multiplied by 12 produceth 240 Pence, which being multiplied by 4 produceth 960 Farthings, as *per* Margent.

20 Shill.
12
240 Pence.
4
960 Farth.

Example II. In 657600 Farthings I demand how many Pence, Shillings, and Pounds?

This Question is the Reverse of the former, and may serve for a proof thereof: First I divide the Farthings by 4, and the Quotient is 164400 Pence, then I divide the Pence by 12, and the Quotient is 13700 Shillings, and the Shillings I divide by 20,

and the Quotient is 685 Pounds, which is equal to the given number in the first Example See the whole operation as followeth:

qr.	12) *d.*	20) *s.*	*l.*
4) 657600	(164400	(13700	(685
.....	.....		
4	12		
25	44		
24	36		
17	84		
16	84		
16	(000)		
16			
(000)			

VII. When in Reduction descending the number propounded to be reduced, consisteth of divers Denominations, as of *Pounds*, *Shillings*, *Pence* and *Farthings*, or of *Pounds*, *Ounces*, *Penny-weights*, and *Grains*, &c. then you may readily reduce it into the lowest Denomination, thus, when you reduce an higher Denomination into the next inferior, add to the product the expressed parts into which you reduce it, as if you were to reduce

reduce Pounds into Shillings, add to the product (as you multiply) the Shillings that are expreſſed in the number propounded; proceed in the ſame method till ye have reduced the given number into the Denomination required, as in the following Example.

Example III. Reduce 567 *l.* -15 *s.* -6 *d.* -3*qr.* into Farthings.

Firſt I multiply by 20 to bring it into Shillings, ſaying, 0 times 7 is 0, but 5 is 5, (taking in the 5 that is in the place of Unites in the Rank of Shillings, and ſetting it in the place of Units in the product;) then 2 times 7 is 14, and 1 is 15, (taking in the 1 that is in the place of Tens in the Rank of Shillings) ſo I ſet down 5 in the place of Tens in the product, *&c.* the product is 11355 Shillings; then I multiply the Shillings by 12 to bring them into Pence, ſaying, 2 times 5 is 10, and 6 is 16, (taking in the 6 that ſtands in the Rank of Pence) *&c.* and the Pence make 136266; then I multiply my Pence by 4 to bring them into Farthings, ſaying, 4 times 6 is 24 and 3 is 27, (taking in the 3 which ſtands in the Rank of Farthings) *&c.* ſo the Farthings amount to 545067, as by the whole operation appeareth.

567 *l.* — 15*s.* — 06*d.* — 3*qr.*
20

11355 Shillings.
12

22716
11355

136266 Pence.
4

545067 Farthings.

Obſerve the like in any other Example.

VIII. When in Reduction aſcending any thing remains after Diviſion is ended, it is alwaies of the ſame Denomination with the Dividend, as in the following Example.

Example IV. In 545067 Farthings I demand how many Pounds?

Firſt I divide the given number of Farthings by 4, and the Quotient is 136266 Pence, and there remains 3, which is 3 Farthings, becauſe the Dividend was Farthings.

Then I divide the Pence by 12, and the Quotient is 11355 Shillings, and there remaineth

maineth 6, which is 6 Pence, becauſe the Dividend was Pence.

Then I divide the Shillings by 20, and the Quotient is 567 *l.* and there remaineth 15, which is Shillings, becauſe the Dividend was Shillings: So that I find by the work, 545067 Farthings to be 567 *l.*—15 *s.*—6 *d.*—3 *qr.* as by the following work.

qr.	12) *d.*	20) *s.*	*l.*
4) 545067	(136266	(11355	(567
4	12		
14	16		
12	12		
25	42		
24	36		
10	66		
8	60		
26	66		
24	60		
27	Rem. (6) pence		
24			

Remains (3) Farthings.

facit 567 *l.*—15 *s.*—06 *d.*—3 *qr.*

This Question is the inverse of the third Example, and may very well serve for a proof thereof, as you may observe at your Leisure.

Here by the way take notice that when you are (to divide any number by 20, that is,) to bring Shillings into Pounds, the best way is to cut off a Figure to the right hand, for Shillings, and then to take half the Figures to the left hand for Pounds, and if 1 remain it is 10 Shillings, to be added to the Figure first cut off.

Example. If it were required to reduce 78546 Shillings into Pounds, I first cut off the first Figure to the right hand, which is 6, for Shillings, and take half the Remainder thus, *viz.* the half of 7 is 3, (which I put under the line) and there remains 1, which makes the next Figure 18, then I proceed, saying, half of 18 is 9, which I put in its place under the line, then the half of 5 is 2, (which I put under the line) and there rests 1, which makes the next Figure 4 to be 14; then I say the half of 14 is 7, which I put under the line, and the work is done, and I find it to make 3927 *l.* —6 *s.* as *per* Margent.

78546
39273 *l.*—6 *s.*

In

In like manner in the last Example, where 11355 Shillings is to be reduced into Pounds, I cut off the last Figure 5 for Shillings, and say, half of 11 is 5, half of 13 is 6, half of 15 is 7, and there remains 1, which makes the 5 Shillings to be 15 Shillings; and this Method shall be generally observed hereafter.

1135|5	
567—15	

Example. V. In 7642 *l.*—17 *s.*—11 *d.*—2 *qr.* I demand how many Farthings? *facit* 7337182, as by the following operation appears.

7642 *l.* — 17 *s.* 11 *d.* — 2 *qr.*

20

152857 Shillings.

12

305715

152858

1834295 Pence.

4

7337182 Farthings.

Example VI. In 5846742 Farthings I demand how many Pounds? *facit* 6090 *l.* — 07 *s.* — 01 *d.* — 2 *qr.*

```
                    12)        2|0)
4 ) 5846742 ( 1461685 ( 12180|7
    .......     ......
    4           12   facit 6090l.7s.1d.2qr.
    ---         ---
    18          26
    16          24
    ---         ---
     24          21
     24          12
     ---         ---
      06          96
       4          96
      ---         ---
       27          085
       24           84
       ---         ---
        34   Rem.( 1 ) Penny.
        32
        ---
        22
        20
Remains ( 2 ) Farthings.
```

Example

Example VII. In 7649 l. how many Groats?

Here I consider that 60 Groats is a pound, wherefore I multiply the Pounds by 60, and the product is 458940 Groats.

7649 l.	20 shillings
60	3
facit 458940 groats	60 groats in a l.

Example VIII. In 4876 l. I demand how many Three-pences?

Here I consider that 80 Three pences make a pound, wherefore I multiply by 80 and the product is 390080 Three-pences.

4876 pounds	20 shillings
80	4
facit 390080 3 pences.	80 3 pences in a l.

Example IX. In 74588 Groats I demand how many Pounds?

Divide by 60 and the Quotient is 1243 l. and there remains 8, which (by the 8 Rule) is 8 Groats, or 2 s. 8 d. or else divide the given number of Groats by 3 to bring them into shillings, and it makes 24862 shillings, and 2 Groats or 8 pence remains, then the shillings being divided by 20 Quote 1243 l. 2 s. 8 d. as follows.

60) 74588 (1243 l.—2 s.—8 d.
20)
3) 74588 (24862
(2) 1243—2—8

Example X. In 4375 Three-pences I demand how many Pounds?

Divide the Three-pences by 80, and the Quotient is 54 pounds, and there remains 55 Three-pences, which being divided by 4 Quotes 13 shillings, and there remains 3 Three-pences, which is 9 d. So the answer is 54 l.—13 s.—09 d.

l. s. d.
80) 4375 (54—13—09
40
37
32
Rem. (55) Three-pences
4) 55 (13
4
15
12
3

Exam-

Example XI. In 58467 Nine-pences, I demand how many pounds?

Multiply the Nine-pences by 9, and the product is 526203 pence, which being divided by 12, and then by 20 gives the answer 2192 l.—10 s.—03 d.

58467 Nine pences

9

12) 526203 (43850

48

46
36

102
96

60
60

Rem. (03) pence

20)

2192 l.—10 s.—3d.

Example

Example XII. In 586 l. I demand how many pieces of 4 d. ½ ?

Reduce the Pounds into half pence, and then divide the half pence by 9, (because 9 half pence make 4 d. ½) and the Quotient gives the answer 31253 pieces of 4d. ½.

586 l. 20 s.

480 12

46880 240 pence

2344 2

480 half pence

9) 281280 (31253

27

11

9

22

18

48

45

30

27

Rem. (3) half pence

Example

Example XIII. In 5846 peices of 13 d. $\frac{1}{2}$, I demand how many Pounds?

Reduce the Thirteen-pence Half-penies into Half-pence, and they make 157842, which being reduced into pounds make 328 l. 18 s. — 05 d.

	d.	d.
5846 pieces of	13 $\frac{1}{2}$	13 $\frac{1}{2}$
27		2
40922		27 half pence
11692		
24) 157842 (65718		
144	328 l. — 18 s. — 5 d.	
138		
120		
188		
168		
202		
192		

Rem. (10) half-pence or 5 d.

Example

Example XIV. I would have 460 *l.* to be changed into pieces of 13 d. ½, of 12 d. of 9 d. of 6 d. and of 4 d. And I would have of each an equal number, now I demand how many pieces of each I ought to have?

Add the several pieces together, and they make 44 d. ½. which reduced into half pence make 89. Then reduce the given number of Pounds also into half pence, and they make 220800, which being divided by 89 the Quotient gives 2480 for the answer, and there is a remainder of 80 half pence. See the whole work as followeth.

460 l.
480 half-pence in a l.

368
184

89) 220800 (2480
178
428
356
720
712
Rem. (80) half pence.

13 d. ½
12
9
6
4

44 ½
2

89 half pence

The

The proof of the foregoing Question.

		L	s.	d.
2480	pieces of 13 *d.* ½ make—	139	10	00
2480	shillings is ———	124	00	00
2480	Nine pences is ———	93	00	00
2480	Six pences is ———	62	00	00
2480	Groats is ———	41	06	08
80	Half-pence remaining is	00	03	04
	Sum is	460	00	00

Example XV. In 476 l.–14 s. I demand how many Dollars at 4 s.–8 d. per Dollar? *Facit* 2043.

Example XVI. In 846795 Dollars at 4 s. 8 d. I demand how many pieces of 13 d. ½? *Facit* 3512631 and 3 half pence.

Example XVII. In 258 Pistols at 17 s. 6 d. I demand how many pieces of 4 d. ½? *Facit* 12040.

Example XVIII. In 4864 Marks at 13 s. 4 d. I demand how many Guinea's at 21 s. 6 d.? *Facit* 3016 and 112 pence or 9 s. 4 d. over.

Example XIX. In 4640 Guinea's at 21 s. 6 d. I demand how many Pistols at 17 s. 6 d.? *Facit* 5700 and 10 shillings over.

Exam-

Example XX. In 1480 l. I demand how many pieces of 13 d. ½, of 12 d. of 9 d. of 6 d. of 4 d. ½, of 4 d. of 3 d. of 2 d. and of 1 d. so that there be an equal number of each sort? *Facit* 6458 pieces of each and 10 d. over.

Reduction of Troy Weight.

Example 21. In 364 l.-08 oz.-18 pw 22 gr. I demand how many Grains? *Facit* 2100934 Grains.

l.	oz.	pw.	gr.
364	08	18	22
12			
736			
364			
4376 Ounces			
20			
87538 Peny weights			
24			
350154			
175078			
2100934 Grains			

Exam-

Example 22. In 764838 Grains, I demand how many Pounds, *&c.* *Facit* 132 l. 9 oz. 8 pw. 6 grains.

gr. 2|0

24) 764838 (31868 peny weights

l. oz. pw. gr.

72 12)1593(132-09-08-06

44 12

24

208 139

192 36

33

163 24

144

198 (9) ounces.

192

Rem. (6) Grains

Example 23. I demand how many Spoons may be made of 20 l. of Silver, each Spoon to be 1 oz. —18 pw. *Facit* 126 Spoons and 16 pw. over.

Example 24. A Goldsmith hath 34 Silver Salts each weighing 6 oz.—14 pw.—12 gr. to be melted down, I demand the weight of an

an Ingot made of the same? *Facit* 19 l. 13 pw. for the weight of the Ingot.

Example 25. I demand how many Tankards each weighing 15 oz. —10 pw. may be made of 24 Ingots of Silver, each weighing 3 l. —08 oz.—11 pw.—20 gr.? *Facit* 69 Tankards and 336 Grains over.

Example 26. A Merchant sent to a *Silversmith* 60 Ingots of Silver, each weighing 3 l. 8 oz. and gave him order to make it into Tankards of 2 l. 3 oz. 10 pw. Plates of 1 l. 4 oz. Salts of 4 oz. 11 pw. 16 gr. and Spoons of 2 oz. 5 pw. and ordered him to make of each an equal number: Now I demand how many of each he must make? *Facit* 52 of each and there remains 10880 Grains.

Reduction of Averdupois Weight.

Example 27. In 24 C. 1 qr. 18 l. I demand how many Pounds, and Ounces? See the whole Operation as followeth.

C.	qr.	l.
24	1	18
4		
97	Quarters	
28		
784		
195		
2734	Pounds	
16		
16404		
2734		
43744	Ounces	

But the moſt conciſe Method of reducing Hundreds into Pounds, and leſs liable to miſtake it thus, *viz.* place the Number of Hundreds under it ſelf, and then the ſame again a place nearer to the left hand, and after that the ſame again a place nearer than the laſt, to the left hand, and then add theſe 4 Numbers together as they ſtand, and their ſum is the Pounds required. As if it were required to reduce 46 C. into Pounds, if you place 46, 4 ſeveral times as you ſee in the following work,

work, and then add them all together, their Sum is 5152 for the Number of Pounds required.

46
46
46
46

5152 Pounds

And if there be any odd quarters and pounds, you may for 1 quarter put 28 l. for 2 quarters 56 l. for 3 quarters 84 l. in order under the said Number of Hundreds, *viz.* Units under Units, *&c.* as also the odd pounds.

C.	qr.	l.
24	1	18
24		
248		
2428		
1		
2734		

So in the 27 *Example* foregoing, where it is required to reduce 24 C. 1 qr. 18 l. into pounds, after I have put my 24 under one another 4 times as is before directed, then for the quarter I put 28, and also the 18 as you see in the Margent, and having added them together their Sum is 2734 l. as before.

Example 28. In 7485 l. I demand how many C. weight? *Facit* 66 C. 3 qr. 9 l.

28)

```
        l.   4)   C.  qr.  l.
28) 7485 (267 (66—3—09
    ...   ..
    56    24
    ----  ----
    188   27
    168   24
    ----  ----
    205   (3) quarter
    196
    ----
Rem. (9) pounds
```

Example 29. A Chapman buyeth of a Grocer 17 C. weight of *Pepper*, and ordereth him to make it up into parcels of 2l. 8 oz. each, I demand how many ſuch parcels the ſame will make? *Facit* 761 parcels, and 24 Ounces over.

Example 30. A Chapman buyeth 7 C. weight of Tobacco, and ordereth it to be made up into paper or parcels of 1 oz. of 2 oz. of 3 oz. of 4 oz. of 5 oz. and of 6 oz. but he will have of each an equal Number; now I demand how many of each he ought to have? *Facit* 597 parcels of each and 7 Ounces over.

Re-

Reduction of Cloth Measure.

Example 31. In 748 Yards I demand how many Quarters? *facit* 2992 Quarters of Yards.

Example 32. In 5648 Yards I demand how many Ells *English*? *facit* 4518 Ells, and 2 Quarters of a Yard over.

Multiply the Yards by 4, and the Product is Quarters of Yards, and then divide the Quarters by 5, and the Quotient will be the Ells required.

Or else (which is more concise) multiply the given Number of Yards by 8, and then cut off one Figure from the right hand, and the rest will be the Ells required, and the Figure so cut off will be half Quarters of Yards.

So in the last Example 5648 being multiplied by 8, the Product is 45184 from which cutting off one Figure (which here is 4) from the right hand with a dash of the Pen, gives 4518 Ells, and 4 half Quarters of a Yard, which is 2 Quarters.

5648 Yards.
8

Ells. 4518|4 half Quarters or 2 Quarters.

Likewise

Likewise if you are to Reduce Ells *English* into Yards, Multiply the Ells by 5, and Divide the Product by 4, and the Quotient is yards, and if any thing remain it is Quarters of a Yard.

Or else (which is more concise) annex a Cypher to the given Number of Ells *English*, and then Divide by 8, and the *Quotient* will be Yards, and the Remainder (if any) will be half quarters of yards.

Example 33 In 854 Ells *English* I demand how many yards? *Facit* 1067 yards and 2 quarters.

854 Ells
5

4) 4270 (1067 yds
4
027
24
30
28
Rem. (2) Quarters

8) 8540 (1067 yds
8
054
48
60
56
Rem. (4) half qrs. or 2 quarters.

Alſo to reduce Ells *Engliſh* into Ells *Flemiſh* you may Multiply by 5 and Divide by 3, and if any thing remains it is quarters of a yard.

Or (more concisely) annex a Cypher to the Number of Ells *Engliſh*, and Divide by 6, and the Quotient is Ells *Flemiſh*, and if any thing remain it is half Quarters of a Yard.

Example 34. In 758 Ells *Engliſh*. I demand how many Ells *Flemiſh*? *Facit* 1263 and 1 quarter of a yard.

758 Ells *Engliſh*
5

3) 3790 (1263 Ells *Fl.*
3
7
6
19
18
10
9
Rem. (1) Quarter.

6) 7580 (1263
6
15
12
38
36
20
18
Rem. (2) half qr.

In

In like manner Ells *Flemiſh* may be reduced to Ells *Engliſh* by Multiplying by 3 and Dividing by 5, and if any thing remain it is quarters of a yard.

Or (more conciſely) Multiply the Ells *Flemiſh* by 6, and from the product cut off one Figure to the right hand with a daſh of the Pen, and the reſt will be Ells *Engliſh*, and the figure ſo cut off is half Quarters of a yard.

Example 35. In 763 Ells *Flemiſh* I demand how many Ells *Engliſh*? *Facit* 457 and 4 Quarters of a yard over.

```
  763
    3
 -----
5) 2289 ( 457
   ...
   20
 -----
   28
   25
 -----
    39
    35
 -----
Rem. (4) quarters of a yard

  763
    6
 -----
Ells Eng. 457|8 half quarters.
```

Example 36. In 584 yards, I demand how many Ells *Flemiſh*? *Facit* 778 Ells and 2 qrs. of a yard.

Example 37. In 864 Ells *Flemish.* I demand how many yards? *Facit* 648.

Reduction of Long Measure.

Example 38. I demand how many Furlongs, Perches, Inches and Barly Corns will reach from *London* to *Berwick* upon *Tweed* it being computed 259 Miles? *Facit* 49230720 Barly Corns.

259 *Miles.*
8 *Furlongs in a Mile.*

2072
40 *Perches in a Furlong.*

82886 *Perches in* 259 *Miles.*
33 *Half Feet in a Perch.*

248640
248640

2735040 *Half Feet in* 259 *Miles.*
6 *Inches in half a Foot.*

16410240 *Inches in* 259 *Miles.*
3 *Barly Corns in an Inch*

49230720 *Barly Corns in* 259 *Miles, and so many will reach from* London *to* Berwick.

Example

Example 39. The whole Circumference of the Earth is 360 degrees, each degree being 60 Miles; now I demand how many *Miles*, *Furlongs*, *Perches*, *Inches*, and *Barley Corns*, will reach round the World?

360	*Degrees.*
60	*Miles in a Degree.*
21600	*Miles about the Earth.*
8	*Furlongs in a Mile.*
172800	*Furlongs about the Earth.*
40	*Perches in a Mile.*
6912000	*Perches about the Earth*
33	*Half Feet in a Perch*
20736000	
20736000	
228096000	*Half Feet about the Earth.*
6	*Inches in a Half Foot.*
1368576000	*Inches about the Earth.*
3	*Barly Corns in an Inch.*
4105728000	*Barly Corns about the Earth.*

By the work of the foregoing Example I find the whole Circumference of the Earth to be 21600 Miles, which is 4105728000 *Barly Corns*. So that a Footman by Travelling 20 Miles a Day, may Travel round the Earthly Globe in 1080 days, which is 15 days less than 3 years. But this Calculation does not exactly agree with Mr. *Richard Norwood*'s Experiment in Measuring the distance between *London* and *York*; as you may see in his Treatise Entituled, *The Seamans Practise*.

Reduction of Time.

Example 40. In the Year of our Lord 1164, *London-Bridge* was new Built of Timber, I demand how many Minutes it is since then to this present year 1692.

1692

1692 present Year
1164 *London Bridge* Built.

528 years since it was built.
365 days in a year

2640
3168
1584

192720 days since its building
24 Hours in a day natural

770880
385440

4625280 Hours since its building
60 Minutes in an Hour

277516800 Minutes since the building of *London Bridge*.

But Note, that according to the foregoing calculation there is lost 6 Hours in every year, or 1 day in every 4 years, to Correct which you may Multiply the number of years to be reduced by 6, and the Product will give you the Hours to be added to the given time reduced into Hours; as in the following Example.

Example 41. I demand how many Days, Hours, and Minutes it is since the Birth of our Saviour Jesus Christ to this present year it being now 1692 years?

1692	Years	1692	
365	Days in a Year	6	
8460		10152	hours to be added
10152			
5076			
617580	days since the Birth of Christ.		
24	Hours in one day.		
2470320			
1235160			
14821920			
10152	Hours added.		
14832072	Hours since the Birth of Christ.		
60	Minutes in an Hour.		
889924320	Min. since the Birth of Christ.		

I might proceed to give Examples of *Reduction* of Dry and Wet Measure, Motion, *&c.* But being well acquainted with the Tables

Tables delivered in *Addition*, the Learner may practice himself in other Questions belonging to this Rule at his Pleasure.

CHAP. VII.

The Single Rule of Three Direct.

I. THe *Rule of Three* is so called because in it there are always 3 Numbers given to find out a fourth. It is also called *the Golden Rule* for its excellent performances in the Art of Numbers.

II. The Rule of Three is either Single or Compound.

III. The single Rule of Three is either *Direct*, or *Inverse*.

IV. The Single Rule of Three *Direct* is when there are 3 Numbers given to find out a fourth in a Direct proportion; That is, when the fourth Number ought to bear such proportion to the third as the second doth to the first; Or, as the first is in Proportion to the second, so is the third to the fourth. This is called a Direct Proportion.

V. In the Single Rule of Three, the two firſt of the given Numbers imply a Suppoſition, and the third a Demand.

VI. The 3 given Numbers muſt be ranked in ſuch order, as that the number to which the demand is affixed may poſſeſs the third place, and that Number in the Suppoſition, that is of the ſame name, kind or quality with that in the third place, muſt poſſeſs the firſt place, and the other number in the Suppoſition muſt poſſeſs the ſecond place, and is evermore of the ſame name, kind or quality with the Number ſought.

Example. If 18 yards of Chamblet coſt 72 s. what will 596 yards coſt at that Rate?

In this Example the ſuppoſition is this, *viz.* If 18 yards coſt 72 ſhillings. And in the other Number (96) is implyed a Demand, *viz.* What will 596 yards coſt? Therefore muſt 596 yards be the third Number, and that Number in the Suppoſition which is of the ſame kind with 596 muſt be the firſt Number, which here is 18, becauſe that ſignifieth yards as well as the third Number; And the other Number in the Suppoſition which here is 72, is the ſecond Number, and is of the ſame kind with the fourth Number, or Number ſought; for the Number ſought by the Queſtion is the price of 596 yds, and the ſecond

cond Number is the price of the first, *viz.* 72 ſhillings. Now the given Numbers being duly ſtated and ranked according to the foregoing directions will ſtand thus,

yds	s.	yds
18	72	596

VII. In the Single Rule of Three Direct if you Multiply the ſecond Number by the third, or (which is all one) the third Number by the ſecond, and divide the Product thereof by the firſt, the Quotient thence ariſing is the fourth proportional number ſought, or Anſwer to the Queſtion. As in the foregoing Example, *viz.* If 18 yards of Camblet coſt 72 ſhillings, what will 596 yards coſt at that rate? The Numbers given in the Queſtion being ranked according to the Directions given in the ſixth Rule, I multiply the ſecond number (72) by (596) the third number, and the Product is 429 2, which being divided by (18) the firſt Number, the Quotient is 2384, which is the fourth Number or anſwer to the Queſtion. See the whole operation as followeth, *viz.*

yds.	s.	yds	s.
18	72	596	2384

72

1192
4172

18) 42912 (2384
....
36

69
54

151
144

72
72

(0)

Facit 2384 shill. or
£ s.
119 — 04

VIII. When (according to the foregoing Directions) you have found out the Answer to the Question, you are always to esteem it of the same name that your second number was of, or reduced to. So here in the foregoing Example the answer to the Question is 2384 shillings, because the second number is 72 shillings. And if the second number had been reduced

reduced into Pence it makes 864, and then the anſwer would have been 28608 pence as by the following operation appears.

```
 yds      s.      yds
 18 —— 72 —— 596
        12
       ----
       144
        72
       ----
       864
       596
      ----
      5184
     7776
    4320
    -------
18) 514944 (28608
    .....
    36
    ----
    154
    144
    ----
     109
     108
     ----
      144
      144
      ---
       (0)
```

facit 28608 d. or 2384 s. equal to 119l. 4s. as before.

Likewiſe if the ſecond Number had been reduced into Farthings, it would have been 3456, which being multiplied by (596) the third Number, the Product is 2059776, which

which being divided by (18) the firſt number, the Quotient is 114332 Farthings, equal to 119 l. 04 s. as before; which you may prove at your leiſure.

IX. When the ſecond Number conſiſteth of divers Denominations, as of Pounds and Shillings, or of Pounds, Shillings, and Pence, Then you muſt reduce it to the loweſt name mentioned or lower if you pleaſe, and then multiply the ſecond by the third, and divide the Product by the firſt, *&c.* as before directed.

Example 2. If 26 yards of Broadcloth coſt 12 l. 02 s. 08 d. what will 248 yards of the ſame coſt at that rate?

The given Numbers in the Example being ranked according to the Directions given in the ſixth Rule aforegoing will ſtand thus,

yds	l.	s.	d.	yds
26	12	02	08	248

Here the ſecond number conſiſteth of divers denominations, *viz.* Pounds, Shillings and Pence, Therefore muſt it be reduced to the loweſt name mentioned, which is Pence, and it makes 2912, which being Multiplied by (248) the third number, the Product is 722176, which being Divided by (26) the Firſt Number, the Quotient is

is 27776 Pence, becauſe the ſecond Number was reduced into Pence, which is the Anſwer to the Queſtion, and may be reduced to 115 l. -14 s. -08 d. As you may ſee by the following Operation.

yds. *l.* *s.* *d.* *yds.*
26 — 12 — 02 — 08 — 248

20
242 ſhillings
12
2912 pence
248
23296
11648
5824

12) 20)
26) 722176 (27776 (231|4
52 24 *facit* 115 *l.* — 14 *s.* — 08 *d.*
202 37
182 36
201 17
182 12
197 56
182 48
156 8
156
(0)

X. If the firſt and third numbers, or either of them, conſiſt of divers denominations, then muſt they be both reduced to the loweſt denomination mentioned in either of them, as if the firſt number be hundred weights only, and the third be Hundreds, Quarters, and Pounds, then muſt they be both reduced into Pounds, becauſe pounds are mentioned in the third number. Or if the firſt and third numbers being of one kind are notwithſtanding of different denominations, then muſt they be reduced to one denomination, as if the firſt be Pounds of weight, and the third be Hundred weights, then muſt the third Number be reduced to pounds as is the firſt.

Example 3. If 1 C. weight of Tobacco coſt 4 *l.*—5 *s.*—2 *d.* what will 34 C.—3 qrs. —18 l. coſt at that rate?

In this Example becauſe the third Number has pounds mentioned therein, therefore muſt the firſt and third numbers be both reduced to pounds, and the ſecond number which is 4 *l.*–05 *s.*–02 *d.* muſt be reduced into Pence by the 5th. Rule of Chap. V. and then the ſecond number being multiplied by the third, the Product is 3990620 which being divided by the firſt, the Quotient is 35678 pence, which is equal to 148*l.*–13*s.*–02*d.* and 84 remaineth, and how that or any other ſuch like remainder may be ordered, ſhall be taught by and by. See the following operation.

1

```
C.        l.  s.  d.          C. qrs. l.
1 ———— 4-05-02 ———— 34-3-18
112       20                  34
———      ———                 344
112 l.    85                 3488
          12                   1
        ————                ————
        1022 pence          3910 l.
        3910
        ————
        10220
       9198
      3066
      ————— ——— 12)        20)
112) 3996020 (35678 (297|3
      .....   ....        ————
      336      24         148 l.-13 s.-02 d.
      ———      ———
       636     116
       560     108
       ———     ———
        760      87
        672      84
        ———     ———
         882      38
         784      36
         ———     ———
          980 Rem. (2) pence
          896
          ———
Rem.     (84)
```

Example 4. If 14 l. of Sugar cost 5 *s.* 3 *d.* what will 46 C. weight cost at that rate?

In

In this Example the third number must be reduced into pounds because the first number is pounds, and it makes 5152, and the second number must be reduced into pence, making 63, then the second number being multiplied by the third, the product is 324576 which being divided by (14) the first number, the Quotient is 23184 pence for the Answer; which is equal to 96 l. 12 s. as by the following operation appears.

```
l.    s.  d.    C.
14——5—03——46
     12        46
   ———        46
     63       46
              ————
              5152
                63
              ————
              15456
             30912      12)
        14) 324576 ( 23184 (193|2
             28        12        96 l.—12 s.
             ——        ——
              44       111
              42       108
             ——        ——
              25        38
              14        36
             ——        ——
              117       24
              112       24
             ——        ——
               56      (0)
               56
             ——
              (0)
```

X. When

XI. When you have multiplied the ſecond number by the third, and divided the Product thereof by the firſt. If any thing remain after Diviſion is ended, it is part of an Unit in the Quotient and its value may be found out thus, *viz.*

Multiply the ſaid Remainder by the parts of the next inferior Denomination that are equal to an Unit of the Quotient, and divide that product by the firſt Number, ſo ſhall the Quotient be the value of the ſaid remainder in the ſaid parts, and if any thing yet remain, multiply it by the parts of the next inferiour Denomination, that are equal to an Unit of the laſt Quotient, and divide the product by the ſaid firſt Number, *&c.* Proceed thus till you have brought it as low as you deſire: and if any thing remain at laſt of all, it is part of an Unit of the leaſt Denomination into which you reduced the ſaid Remainder, and muſt be placed according to the Direction given in the fourth Rule of the Fifth Chapter.

In the third Example foregoing after the Diviſion is ended, there is a remainder of 84, which ſheweth that the anſwer to the Queſtion is not exactly 35068 pence, or 148 *l.*—12 *s.*—02 *d.* as it is there found, but it is ſomething more; therefore to find the value of this Remainder 84, I multiply it by 4, (becauſe 35678 the ſaid Quotient is pence) and the product is 336, which I divide by the firſt Number 112, and the Quotient is 3 Farthings, without any other Remainder, and ſo is the true Anſwer to that Queſtion 148 *l.*—13 *s.*—02 *d.*—3 *qrs.* Mind the Operation of the next Example.

Example 5. If 1 C. weight of Currans coſt 2 *l.*—14 *s.* what will 24 *C.*—3 *qrs.*—16 *l.* coſt at that rate?

1 C.

C. l. s. C. qrs l.
1—2—14—24—3—16
112 20 4
112 54 shill. 99 qrs
28
798
199
2788 l.
54
11152
13940
112) 150552 (134|4 2|0
112 *facit* 67 *l.*-04 *s.*-02 *d.*-2 *qrs.*
385
336
495
448
472
448
Remain (24)
12
112) 288 (2 d.
224
Remain (64)
4
112) 256 (2 qrs.
224
Remain (32)

In the work of the foregoing Example you may obſerve that the ſecond number is reduced no lower than ſhillings, making 54; therefore the Quotient is 1344 ſhillings equal to 67 *l.* – 04 *s.* and there is a Remainder of 24: Therefore to find out how many pence is contained therein, I Multiply it by 12, and the product is 288, which being divided by 112 (becauſe that is the firſt number) the Quotient is 2 pence, and there is a Remainder of 64, which I multiply by 4, (to find its value in Farthings,) and the product is 256, which I divide again by 112 and the Quotient is 2 Farthings, and there is a remainder of 32, which according to the 4th. Rule of Chapter V. is $\frac{32}{112}$ of a Farthing; and to the Anſwer to the Queſtion is 67 *l.* – 04 *s.* – 02 *d.* – 2 *qrs.* $\frac{32}{112}$. The like may be obſerved of any other.

Example 6. If 24 yards of Camblet coſt 4 *l.* – 16 *s.* I demand how many yards I may buy for 126 *l.* *Facit* 630 yds. The terms being ranked as is directed in the ſixth Rule of this Chapter will ſtand thus, *viz.*

l.	*s.*	*yds*	*l.*
4	16	24	126?

Example 7. If I pay for an Ounce of Silver 5 *s* – 04 *d.* I demand how much, I muſt give

give for 46 *oz.* —15 *pw.*—12 *gr.*? *Facit* 12 l. —09 *s.*—05 *d.* $\frac{288}{1440}$.

Example 8. If 12 yards of Broad-cloth cost 7 *l.* — 06 *s.* I demand how much I ought to give for 26 pieces, each piece containing 27 yards? *Facit* 427 *l.*— 01 *s.*

Example 9. If 18 yards of *Cambrick* cost 4 *l.* —13 *s.* I demand the price of 73 pieces, each piece containing 34 Ells *Flemish*? The Ell *Flemish* being 3 quarters of a yard? *Facit* 480 *l.*—17 *s.*—09 *d.*

Example 10. If 17 C. $\frac{1}{4}$—17 *l.* of *Tobacco* cost 145 *l.*—12 *s.* I demand how much the Ounce stands me in at that rate? *Facit* 1 *d.* $\frac{2864}{3200}$ *per Ounce.*

Example 11. If 28 *l.* of Lead cost 5 *s.*—11 *d.* I demand the Price of 54 Fother each being 19 C. $\frac{1}{2}$? *Facit* 1246 *l.* 01 *s.*

Example 12. When 7 *l.* of *Tobacco* cost 5 *s.* — 09 *d.* $\frac{1}{2}$, what will 30 C. weight cost? *Facit* 139 *l.*

Example 13. When the Tun of Wine cost 51 *l.* —14 *s.* what cost the Quart at that Rate? *Facit* 13 *d.* $\frac{1}{2}$.

Example 14. At a Noble *per* Week how many Months Board may I demand for 30 *l.*? *Facit* 22 Months and 2 Weeks.

Example 15. A *Grocer* bought 30 Frails of Raisins, each Frail weighing 3 *qrs.*—07 *l.* at 18 *s.*—08 *d. per* C. I demand how much they

they amount to? *Facit* 22*l.*—15*s.*

Example 16. A Draper bought 12 Packs of Cloth, each Pack containing 25 Cloths, and each Cloth 45 Ells *Flemiſh*, to pay after the rate of 3*l.*—14*s.*—06*d.* for 13 Yards; I demand how much the ſame amounts to? *facit* 2901*l.*—04*s.*—00*d.*—$\frac{24}{52}$.

Example 17 A Corn Factour bought 248 Quarters of Wheat for 511*l.*—06*s.*—08*d.* for an 100 Quarters of which he gave 33*s.*—04*d. per* Quarter, I demand how much he gave *per* Quarter for the Remainder? *facit* 1*l.*—16*s.*—08*d.*

Example. 18. If a Piece of Cloth coſt 21*l.*—05*s.* I demand how many Yards were in the ſame, the Yard being valued at 12*s.*—06*d.*? *facit* 34 Yards.

Example 19. If a Piece of Cloth coſt 24*l.*—05*s.*—04*d.* I demand how many Yards were contained in the ſame, when the Ell *Engliſh* is worth 17*s.*—04*d.*? *facit* 35 Yards.

Example 20. Bought 124 Pieces of Cambler for the Sum of 987*l.* 14*s.* 08*d.* at 4*s.* 8*d. per* Yard, I demand how many Yards there were in all, and how many Ells *Flemiſh* there were in a Piece? *facit* 4216 Yards, and 45$\frac{1}{31}$ Ells *Flemiſh per* Piece.

Example 21. A Gentleman hath an Eſtate of 1224*l. per Annum*, and his Expences one day

day with another amount to 1*l*.—13*s*.—04*d*. I demand how much he layeth up at the Years end to purchaſe with? *facit* 615*l*.—13*s*.—4*d*.

Example 22. A Gentleman expendeth one day with another 43*s*.—06*d*. $\frac{1}{2}$. and at the Years end layeth up 850*l*. I demand his annual Eſtate? *facit* 1644*l*.—12*s*.—08*d*. $\frac{1}{2}$. *per Annum.*

Example 23. At 15*s*.—07*d*. *per C.* Nutmegs, what will 3 *Hhds* come to, each Weight as followeth, *viz.*

	C.	Qrs.	l.
3 *Hhds*	3	2	21
	4	1	14
	4	2	18
Total	12	2	25

12
126
1255
2

1425*l*. at 15*s*.—07*s*. *per C.*
facit 195*l*.—06*s*.—00*d*.—1*qr*. $\frac{3}{112}$.

Example. 24. A Merchant conſigns to his Factour in *Spain* 188 Cloths, with Commiſſion for Sale at 23*l*.—02*s*.—02*d*. *per* Cloth, and

and to make Returns from thence, the one half in Wines at 28 *l. per Tun*, and the other half in Sugar at 27 *s. per C. weight*, I demand how much of each ought to be returned for the Cloaths?

Answer. The whole value of the Cloth is 4344 *l.*—07 *s.*—04 *d.* the half whereof is 2172 *l.*-03 *s.*-08, which will buy 77 $\frac{3384}{7720}$ Tuns of Wine at 28 *l. per Tun*, and the other half will buy 1609 $\frac{8}{84}$ hundred weight of Sugar.

Example 25. If 100 *l.* in 12 Months gain 6 *l.* Interest, what will be the Interest of 896 *l.* for the same time? *Facit* 53 *l.*-15 *s.*-07 $\frac{20}{100}$.

Example 26. A Usurer putteth out 880 *l.* to Interest, and at the end of 12 Months he receives for Principal and Interest 932 *l.*-16 *s.* I demand at what rate *per Cent. per annum* he received Interest? *Facit* 6 *per Cent.*

Example 27. I demand what Principal in 12 Months will gain 64 *l.*—10 *s.* at the Rate of 6 *per Cent.*? *Facit* 1075 *l.*

Example 28. An Orphan is indebted to his Guardian 51 *l.* And the Guardian having in his hands 100 *l.* of the Orphans, it is agreed between them that the Guardian shall keep the same in his hands till the said 51 *l.* be paid by the Interest thereof at 6 *per Cent. per Annum*, Now I demand how long he ought

to keep the ſame at that Rate? *Facit* 8 year and 6 Months.

Ex. 29. A Draper buys 2795 ½ Ells *Flem.* of Ghenting, at 22 *d.* ½ the Ell *Engl.* It is required to know at what price the Cloth muſt be ſold out to gain 15 *l.* 10 *s. per Cent.* Firſt find the price it coſt by the Rule of 3, *fac.* 157 *l.* 4 *s.* 11 *d.* Then ſay, *l. s. d.* If 100 *l.* give 115 *l.* 10 *s.* what will 157 4 11. *facit* 181 : 12 : 4.

Ex. 30. If the aforeſaid Cloth were to be ſold ſo as to loſe 15 *l.* 10 *s. per Cent.* Firſt Subtract 15 *l* 10 *s.* out of 100 *l. ſa.* 84 *l.* 10 *s.* Then ſay, If 100 *l.* fall to 84 *l.* 10 *s.* what ſhall 157 *l.* 4 *s.* 11 *d. fac.* 132 : 17 : 6.

Ex. 31. Three Merchants Company; *A* his Stock was 175 *l.* 12 *s. B* 214 *l.* 19 *s.* 4 *d. C*'s 150 *l.* 11 *s.* 9 *d.* they have gained together 209 *l.* 11 *s.* 4 *d.* I demand each mans part of the ſaid Gain. *Firſt add the ſeveral Stocks into one total,* which makes 541 *l.* 3 *s.* 1 *d.* then make 3 ſeveral Queſtions in the Rule of Three *viz.*

	l. s. d.		*l. s. d.*		*l. s. d.*	
If	541:3:1	give	209:11:4	what	175:12:0	*A*
	541:3:1		209:11:4		214:19:4	*B*
	511:3:1		209:11:4		150.11:9	*C*
				facit		

Add all the *facits* together, if it make up the Money to be divided, your Sum is true,

if

if you have any remains on the Divisions, add them up into one Total, which divide by the common Divisor, and the Quotient add to the lowest denomination.

Ex. 32. Three Merchants Company, *A* Stock was 169 *l.* 5 *s.* for 3 Months, *B* 450 *l.* 7 *s.* for 4 Months, *C* 147 *l.* 12 *s.* for 6 Months, they have gained 209 *l.* 7 *s.* 2 *d.* I demand each Mans part.

This is worked as the last precedent Question, only each Mans Stock is multiplyed by the time, *viz.*

l.	*s.*		*l.*	*s.*		*l.*	*s.*
A 169	5	*B* 450	7	*C* 147	12		
3 *mo.*		4 *mo.*		6 *mo.*			
A 327	15	*B* 1801	8	*C.* 885	12		
1801	8						
885	12						

			l.	*s.*	*d.*		*l.*	*s.*	
3014	15	gain	209	7	2	what will	327	15	*A*
						what will	1801	8	*B*
						what will	885	12	*C*
									facit

Add all the *facits* together, if it make the given Sum 209 *l.* 7 *s.* 2 *d.* your work is true, otherwise false.

The Proof of the Single Rule of Three Direct.

To prove a Question in the *Single Rule of Three Direct*, Multiply the fourth number (or Answer to the Question) by the first, and if the Product thereof be equal to the product of the second and third, then is the operation truly performed; otherwise not, As in the first *Example* of this Chapter, *viz.*

If 18 yards cost 72 shillings, what will 596 yards cost at that rate? The Answer there found is 28608 pence, which is the fourth Number. Now the product of the first and fourth, *viz.* 28608 by 18 is 514944 which is equal to the product of the second and third, *viz.* 864 by 596 as you may see by the following operation, where the second number, *viz.* 72 shillings is reduced into 864 pence.

yds	*d.*	*yds*	*d.*
18	864	596	28608
	596		18
	5184		228864
	7776		28608
	4320		
	514944		514944

And

And here note, that if any thing remain after Division is ended it must be added to the product of the first and fourth numbers, and then must that Sum be equal to the Product of the second and third. As in the third *Example* of this Chapter, which is, if 1 *C.* weight of Tobacco cost 4 *l.*–5 *s.*–2 *d.* what will 34 *C.* 3 *qrs.* 18 *l.* cost?

The 3 given numbers being reduced are 112 *l.* 1022 *d.* and 3910 *l.* and the fourth number or answer to the Question is there found to be 35678 *d.* and the Remainder is 84, the product of the second and third is 3996020, and the product of the first and fourth is 3995936 to which adding the remainder, the sum is 3996020 equal to the product of the second and third which proves the work to be true.

l.	*d.*	*l.*	*d.*
112	1022	3910	35678
		1022	112
		7820	71356
		7820	35678
		39100	35678
		3996020	3995936
		remains add	84
			3996020

CHAP. VIII.

The Single Rule of Three Inverse.

I. THE single Rule of Three Inverse, is when the fourth number, or number sought ought to bear such proportion to the first as the second doth to the third.

II. When a Question in the single Rule of Three is stated, consider whether the fourth number (or answer to the Question) ought to be more or less than the second number, which upon a little consideration you may discover. If it ought to be more than the second, then must the lesser extream be the Divisor, and if it ought to be lesser than the second, then must the biggest of the extreams be the Divisor (in this Case the first and third numbers are called extreams) and if it fall out that the third number is the Divisor, that Question is said to be of the single Rule of Three Inverse. As in the following Examples.

Example 1. If 30 Men can build a Wall in 32 dayes, I demand in how many days 60 men may do the same?

The

The given numbers being ranked according to the Rule of the 7th. Chapter will ſtand as followeth.

men	*dayes*	*men*
30	32	60

Then I conſider whether 60 men will do it in more or leſs dayes than 32, and find that they will require leſs time than 32 dayes, (for the more the men the leſſer the time) wherefore 60 which is the biggeſt extream muſt be the Diviſor, and the firſt and third muſt be multiplied together, and their product which is 960 being divided by the third number 63, the Quotient is 16 dayes and in ſo long time will 60 Men finiſh the ſaid work.

See the following Operation.

men	*days*	*men*	*days*
30	32	60	16

30

60) 960 (16 *days*
60

360
360

(0)

Example 2. If 100 *l.* in 12 Months gain 10 *l.* for the Intereſt thereof, I demand what Principal will gain the ſame Intereſt in 8 Months? Here it being required what Principal will gain 10 *l.* in 8 Months, therefore muſt 100 *l.* Principal be the ſecond number, according to the Directions in the Sixth Rule of the 7th Chapter, and the numbers being Ranked accordingly will ſtand thus

Mon.	*l.*	*Mon.*
12	100	8?

Here I conſider that the ſhorter the time the more muſt be the Principal to gain the ſame Intereſt; wherefore the leſſer extream muſt be the Diviſor, which here is (8) the third number, therefore the firſt and ſecond, *viz.* 12 and 100 muſt be multiplied the one by the other, and the Product is 1200, which being divided by (8) the third number, the Quotient is 150 *l.* and ſo much will gain 10 *l.* Intereſt in 8 Months at 10 *per Cent. per Annum*: See the following work.

12 —— 100 —— 8

12

8) 1200 (150

8

40

40

(00)

Ex. 3. Lent my Friend 120 *l.* for 6 Months, he promising to do me the like courtesie another time; and not long after I had occasion for a sum of Money for 9 Months, I demand how much he ought to lend me for that time, to retaliate my former kindness? *Facit* 80 *l.* the longer the time, the lesser ought the sum of Money to be.

Example 4. A Footman performs a Journey in 12 dayes, when the day is 15 hours long, I demand in how many dayes he may performe the same when the day is 10 hours long? *facit* 18 dayes. The shorter the day, the more dayes will the Journey require.

Example 5. How many yards of Matting that is half yard wide, is enough to cover a Floor that is 16 Foot wide, and 28 Foot long? *facit* 296 *yards* of Matting.

Example 6. Suppose that (according to the Statute) when the Bushel of Wheat cost 4 *s.* the Penny-Loaf ought to weigh Nine Ounces, I demand what the price of the Bushel ought to be, when the Penny-Loaf weigheth 12 Ounces? *facit* 3 *s. per* Bushel.

Example 7. If when the Tun of Wine cost 45 *l.* a certain quantity worth 25 *s.* is sufficient for the Accommodation of 20 Men, I demand how many Men the same 25 *s.* worth will suffice when the Tun is worth 30 *l. facit* 30 Men, for the cheaper the Wine, the more may be bought for the same Money.

Example 8. If when the Tun of Wine cost 45 *l.* a quantity worth 50 *s.* is enough for the Entertainment of 40 Men, I demand the Price of the Tun when 50 *s.* worth is enough for 90 Men? *facit* 20 *l. per* Tun.

Example 9. If 60 Ells at *London* be equal to 100 Ells at *Antwerp*, and each Ell at *London* contains 20 Nails of an *English* Yard, I demand how many such Nails the Ell of *Antwerp* contains? *facit* 12 Nails.

Example

Example 10. If for 3 *l.* 3 *s.* 4 *d.* I can have 10 *C.* weight carryed 140 Miles, I demand how many Miles I may have 14 *C.* weight carryed for the same Money? *facit* 100 Miles.

The Proof of the Single Rule of Three Inverse.

If the Product of the Fourth Term multiplyed by the Third be equal to the Product of the Second multiplyed by the First, then is the work truly performed, otherwise not. Let us prove the First Example of this Chapter, *viz.* If 30 Men can build a Wall in 32 dayes, I demand in how many dayes 60 Men may do the same? The Answer is there found to be 16 dayes, and the four Terms being duely ranked, stand as followeth.

men	*dayes*	*men*	*dayes*
30	32	60	16
	30		60
	960		960

The fourth Term (16) being multiplyed by (60) the third Term is 960, which is equal to the Product of (32) the second Term, by (30) the first.

CHAP.

CHAP. IX.

The Double Rule of Three Direct.

I. THE Double Rule of Three is when there are Five Numbers given to find out a Sixth in proportion thereunto.

II. Question in the Double Rule of Three may be resolved by Two Single Rules of Three, or by *One Rule of Three composed of the Five given Numbers.*

III. When a Question in the Double Rule of Three may be solved by Two single Rules of Three Direct, that Question is said to belong to the Double Rule of Three Direct.

IV. Of the Five Numbers given in the Double Rule of Three, Three of them alwayes imply a Supposition, and the other Two a Demand. As in the following Example.

If 16 Men can reap 96 Acres of Wheat in 36 dayes, I demand how many Acres 64 Men may reap in 48 dayes.

Here the supposition is, If, or suppose 16 Men reap 96 Acres in 36 dayes; and the demand is, how many Acres 64 Men may reap in 48 dayes.

V. When

V. VVhen you would ſolve a Queſtion in the *Double Rule* of *Three*, the given Numbers are to be ſo ranked, that the *Firſt* and *Third* may be of one Denomination, and the *Second* Number muſt be of the ſame Quality, Name, or Denomination with the Number ſought; and *note* that the *Firſt* and *Second* Numbers muſt be alwayes of the Suppoſition, and the *Third* of the Demand. So likewiſe muſt the *Fourth* Number be of the Suppoſition, and the *Fifth* of the Demand, and both of one Denomination; ſo may each Queſtion be ſolved by Two ſingle Rules of Three, Two different wayes. As in the Queſtion foregoing, which being again repeated, is as followeth.

If 16 Men can reap 96 Acres of VVheat in 36 dayes, Howmany Acres may 64 Men reap in 48 dayes? The Numbers being ranked according to the foregoing Directions will ſtand as followeth.

men	*acres*	*men*
16	96	64
days 36		48 *days*

Or Thus,

days	*acres*	*days*
36	96	48
men 16		64 *men*

VI. VVhen

IV. VVhen a Queſtion in the *Double Rule of Three* is to be ſolved at Two ſeveral Operations in the Single Rule of Three, the Anſwer to the Firſt Queſtion muſt be the ſecond Number in the ſecond Queſtion, and the *fourth* and *fifth* Numbers muſt be the *firſt* and *third* in the ſecond Queſtion.

So in the firſt order of ranking the given Numbers in the foregoing Queſtion, the three firſt Numbers are 16 —— 96 —— 64, wherein is implyed this Queſtion, *viz.* If 16 Men can reap 96 Acres, how much may 64 reap in the ſame time, *viz.* in 36 days? Multiply and Divide according to the Directions given in the *Seventh* Rule of the Seventh Chapter, and you will find the Anſwer to be 384 Acres, ſo that now I have found how many Acres 64 Men may reap in 36 days, but by the Queſtion it is required to know how much they can reap in 48 days?

Therefore I ſay again by the Single Rule of Three, If 36 days will reap 384 Acres, how many may be done in 48 days? Multiply and Divide, and you will find the Anſwer to the Queſtion to be 512 Acres, and ſo many may 64 Men reap in 48 days, if 16 Men can reap 96 Acres in 36 days. See the whole work as followeth.

men

men	acres	men
16	96	64
days 36		48 days.
16--96	64	36—384—48
64		48
384		3072
576		1536
Acres		Acres
16)6144 (384		36)18432 (512
48		180
134		43
128		36
64		72
64		72
(0)		(0)

Or if the Five given Numbers of the foregoing Question had been ranked according to the Second Method laid down at the latter end of the *fifth Rule*, the Answer would have been the same, and the Operation as followeth.

36 *days*

dayes	*acres*	*dayes*
36	96	48
men 16		64 *men*

36	96	48
	48	
	768	
	384	
	Acres	
36)	4608 (128	
	36	
	100	
	72	
	288	
	288	
	(0)	

16	128	64
	64	
	512	
	768	
	16) 8192 (512	
	80	
	19	
	16	
	32	
	32	
	(0)	

I doubt not but that by the Operation beforegoing this Rule is sufficiently illustrated, but for the Learners further experience herein, I shall propound several other Examples, and only give their Answers, leaving the Operations to the Industrious Learner.

Example.

Example 2. I demand the Intereſt of 75 *l.* for 18 Months after the rate of 6 *per Cent. per Annum*?

This Queſtion may be more intelligibly ſtated thus, *viz.* If 100 *l.* in 12 moneths gain 6 *l.* Intereſt, what will 75 *l.* gain in 18 months at that rate? *facit* 6*l.* 15 *s.*

Examp. 3. If 12 Men can reap 48 Acres Acres of Wheat in 18 dayes, I demand how many Acres 36 Men may reap in 24 days? *facit* 288 *Acres.*

Examp. 4. If 3 quarters of Malt is ſufficient for a Family of Six Perſons for two months, how many quarters is enough for a Family of 18 Perſons for 12 months? *facit* 54 quarters?

Example 5. If 8 Reapers have 3*l.* 4*s.* for 4 days work, I demand how much 24 men will have for 16 days work? *fac.* 38*l.* 8*s.*

Example 6. If 336 *l.* of Bread is ſufficient for 56 men for 12 days, I demand how much will ſerve 460 men, 96 days? *facit* 22080 of Bread.

Example 7. If 40 Buſhels of Oats be enough for 8 Horſes 20 days, I demand how many buſhels will ſerve 48 horſes 12 days? *facit* 144 buſhels.

Example 8. A Banker took in 250 *l.* to pay Intereſt for the ſame, and at the end of 18 months he payd 272 *l.* 2 *s.* for Principal and

and Intereſt, I demand at what Rate *per Cent. per Annum* he payd Intereſt.

CHAP. X.

The Double Rule of Three Inverſe.

I. WHEN a Queſtion in the Double Rule of Three being ſolved as 2 Single Rules as is taught in the foregoing Chapter, hath one of thoſe Single Rules Inverſe, (for they are never both Inverſe) then is that Queſtion ſaid to be of the *Double Rule of Three Inverſe.*

II. A Queſtion in the Double Rule of Three Inverſe may be ſtated two ſeveral wayes, as well as a Queſtion in the Double Rule Direct, and ſo the Inverted Proportion may be either in the firſt or ſecond Operation at pleaſure.

Example 1. If a Footman Travel 240 miles in 8 days, when the day is 10 hours long, I demand in how many dayes he may Travel 720 miles, when the day is 15 hours long?

The

The given Numbers being ranked according to the fifth Rule of the ninth Chap. will ſtand as followeth:

	miles	*dayes*	*miles.*
	240	8	720
hours	10		15 *hours.*

Or Thus,

	hours	*dayes*	*hours*
	10	8	15
miles	240		720 *miles*

Here according to the firſt manner of ranking the given Terms, the inverted Proportion is in the ſecond ſingle Operation.

You may alſo work the Double Rule of Three either *Direct* or *Inverſe* at one Operation by the *Compound Rule of 5 Numbers*, obſerving to rank the ſeveral Terms as is before taught in the fifth Rule of the ninth Chap.

And if your Queſtion be of the Double Rule of Three Direct, Mult. the three laſt Terms together for Dividend, and the two firſt for Diviſor, as in the following *Examples. Viz.*

If 100*l.* in 12 months require 6*l.* Intereſt, how much Intereſt will 50*l.* require in 10 months.

100*l.*

l.	*mo.*	*l.*	*l.*
100	12	6	50
50	10		10 *m.*
		100	500
		12	6
facit 2 *l.* 10 *s.*		12,00)	30,00
			2,10

But if your Question be of the Rule of 3 *Inverse*, Multiply the *first*, *second*, and *last* Numbers together for Dividend, and the *third* and *fourth* for Divisor, as in the following

Example If 50 *l.* in 10 months require 2 *l.* 10 *s.* Interest? Of what Principal shall the Interest of 6 *l.* make in 12 months.

l.	*m.*	*l.*	*s.*	
If 50	10	2	10	
	12	6		50
				10
		l.	*s.*	
		2	10	500
			12	6
fac. 100 *l.*				
		3,0)		300,0
				fa. 100

But

But a more particular application shall be made of the Double Rule of 3, when we come to treat of Simple Interest.

CHAP. XI.

Practice *a Compendious Method used by Merchants and Tradesmen in casting up their Commodities.*

Practice is an Abbreviation or Contraction of the *Rule of Three Direct*, and is alwayes known by having 1, or an integer for the first Term in the *Rule of Three*: And is called the Rule of *Practice*, from the General use of it among Tradesmen. Or, because Questions of this Nature may be answered by Operations more speedy and practical than by the *Rule of Threes*: But before we proceed further, it will be necessary to give the Learner Tables of such *Aliquot* parts in Money and Weight, which being learned by heart, will very much facilitate his readiness in casting up any sort of Merchandizes.

Practice

PRACTICE TABLE.

l.	*s.*	*d.*	*d.*	*s.*	lb	*C. qr.*
10	0	$\frac{1}{2}$	6	$\frac{1}{2}$	56	$\frac{1}{2}$
6	8	$\frac{1}{3}$	4	$\frac{1}{3}$	84	$\frac{1}{4}$
5	0	$\frac{1}{4}$	3	$\frac{1}{4}$	28	$\frac{1}{4}$
4	0	$\frac{1}{5}$	$1\frac{1}{2}$	$\frac{1}{8}$	14	$\frac{1}{8}$
3	4	$\frac{1}{6}$	1	$\frac{1}{12}$	16	$\frac{1}{7}$
2	6	$\frac{1}{8}$			8	$\frac{1}{14}$
2	0	$\frac{1}{10}$			7	$\frac{1}{28}$
1	8	$\frac{1}{12}$				

I. When the given price is pence, take your parts in shillings, the Product Divide by 20, gives the answer in pounds.

Ex. 254 lb of *Tobac.* at 1*d*, 2*d*, 3*d*, 4*d*, 6*d*. lb

d.		*d.*		*d.*		*d.*
$1\frac{1}{2}$	2 | 1	2		$4\frac{1}{2}$	254 at	4
	1 : 1	2 *fa.*			8 | 4 :	8
d.					4 : 4 :	8 *fa.*
$2\frac{1}{4}$	4 | 2 :	4		*d.*		
	2 : 2 :	4 *fa.*		$6\frac{1}{2}$	12 | 7	
d.					6 | 7 :	*fa.*
$3\frac{1}{4}$	6 | 3 :	6				
	3 : 3 :	6 *fa.*				

Here

Here you see that 254 ℔ of *Tobacco* at 1*d.* a pound: Divided by the $\frac{1}{2}$ gives 21 *s.* 2 *d.* and that divided by 20 (by cutting off the last figures, and taking $\frac{1}{2}$ of it) gives 1*l.* 1*s.* 2*d.* the price of 254 ℔ of *Tobacco*: So for 2 *d.* a ℔ take the $\frac{1}{2}$: because 2*d.* is the $\frac{1}{6}$ part of a shilling, and for 3 *d.* a ℔ take $\frac{1}{4}$: and so for the others at 4 *d.* and 6 *d.*

II. When the given price are such *pence* as are no even part of a shilling, take first the greatest even part of a shilling, and then part of that part; add them together, and divide the product by 20, or cut off the last figure, and take $\frac{1}{2}$.

Ex. 254 ℔ of *Tobac.* at 9*d.* and 10*d.* $\frac{1}{4}$ a ℔.

d.		
$6\frac{1}{2}$	127	
$3\frac{1}{2}$	63	6
9	190	6

9:10:6 *fa*

254 at 10*d.* $\frac{1}{4}$

d.	
$6\frac{1}{2}$	127 shil. in 254 six pen.
$4\frac{1}{3}$	84--8 in 254 groats
$\frac{1}{12}$	10--7 in 254 half pen
$\frac{1}{48}$	5--3$\frac{1}{2}$ in 254 farth.

22|7:6$\frac{1}{2}$

11|7:6$\frac{1}{2}$ *fa.*

Demonstration. In 254 ℔ of *Tobacco* at 10$\frac{1}{4}$ a ℔ there must be 254 sixpences, which is 127 shil and 254 groats, which is 84*s.* 8*d.* and 254 half pence, which is 10*s.* 7*d.* and

254

254 *farth.* which is 5 *s.* 3 *d.* $\frac{1}{2}$, all these added together, make 227 *s.* 6 *d.* $\frac{1}{2}$, which divided by 20, gives the facit, 11 *l.* 7 *s.* 6 *d.* $\frac{1}{2}$.

III. If the given price be any number of pence above 1 *s.* and less than 2 *s.* take the *Aliquot* parts in pence, as in the last precedent, to which add the given quantity for the 1 *s.* and proceed as before.

Ex. 254 lb at 15 *d.*

$3\frac{1}{4}$	63—6
	31|7—6
	15:17-6 *fa.*

254 at 17 *d.*

$4\frac{1}{3}$	84—8
$1\frac{1}{4}$	21—2
	35|9—10
	17:19-10 *fa.*

IV. If the given price be such shill. as are an even part of a pound, take such a part of the given quantity, the answer is pounds.

Ex. 375 *yds* at 2. 2-6. 3-4. 4. 5. 5-6. a *yd.*

s.	*s.*
$2\frac{1}{10}$	37—10 *fa.*
s. d.	*l. s. d.*
2-6 $\frac{1}{4}$	46—17-6 *fa.*
s. d.	*l. s. d.*
3-4 $\frac{1}{6}$	62—10—0 *fa*

375

s.	
$5\frac{1}{4}$	93--15--0 *fa*
	s. — *d.*
$4\frac{1}{5}$	75--00--0 *fa.*
s. d.	*l. s. d.*
6-8 $\frac{1}{3}$	125--00--0 *fa.*

IV. If

V. If the given price be such *shill.* and *pence* as are no even parts of a pound, Multiply the given quantity by the number of *shill.* and take the aliquot parts of *pence*, and proceed as in the *second Rule* of this *Chapter.*

Example 375 yards at *s.* 8 — *d.* 11

8

3000
187—6
125—
31—3
334|3—9

l. 167:3—9 *fa.*

Or if the given price be any numb. of *pounds shill.* and *pence*, Reduce first your pounds and shill. into shill. and proceed as in the last Example.

V. If the given quantity be any number of *yards* and part of a *yard*, work as before where no part is, and for $\frac{1}{2}$ take $\frac{1}{2}$ of the given price, and for $\frac{1}{4}$ take the $\frac{1}{4}$, and add it to the first work.

	s. d.		
Ex. 275½ *yds* at	8-6	18¾ at	8-6
8		8	
½	4-3		4-3
2200		144	2-1½
6½ 137-6		6½ 9	
4-3		6-4½	6-4½
234 1-9		15 9-4½	
l. 117:1-9 *fa.*		*l.* 7:19-4½ *fa.*	

CHAP. XII.

The Order of Deducting TARE and TRET.

GRoſs is the weight of a Commodity, with its *Hogſheads*, *Cheſts*, *Box*, or whatever elſe contains it.

Tare is the allowance given for the weight of the Cask, Hogsſhead, *&c.*

Trett is an allowance of 4 ℔ in 104 ℔, for waſte and duſt on ſome ſort of Goods.

	C.	qr.	℔.		℔.	℔.
Ex. 11 *hhds*			45—3—15	Gros. Tare 14 *per* 112		
14—1/8				how many ℔ Neat.		
			5—2—26	Tare.		
fa.			40—2—17	Neat		

I. Here

I. Here 14 ℔. *tare* being $\frac{1}{8}$ of 112 ℔, take $\frac{1}{8}$ of the *Groſs* the quot. gives the whole *Tare*, which ſubſtract from the Groſs gives the *Neat* weight.

The Operation is performed thus, Divide the *Gr.* by 8, ſay 8 in 45, 5 times, and 5 *C.* remains, which is 20 *q*; *s*, and 3 is 23, then 8 in 23, 2 times, 7 *q*; *s* remains, which turned into pounds by 28, and added to the 15 ℔, makes 211 ℔, then 8 in 211 is 26 times. So the *Tare* is 5 *C.* 2 *q*; 26 ℔.

	C.	*q*;	℔.
Examp.	49	0	17
	22		
	98		
	98		
6 $\frac{1}{2}$	24	—	6
	3	— 4 —	$\frac{3}{4}$
	110 | 5	— 10 —	$\frac{3}{4}$
	55 | 5	— 4 —	$\frac{3}{4}$ *facit*

℔.		*s.*	*d.*	
Neat at		22	— 6	
14	$\frac{1}{8}$	2	— 9 —	$\frac{3}{4}$
2	$\frac{1}{7}$	0	— 4 —	$\frac{3}{4}$
1	$\frac{1}{2}$	0	— 2 —	$\frac{1}{4}$
fa.		3	— 4 —	$\frac{3}{4}$
price of 17 ℔.				

If the *Tare* be 16 in 112, take $\frac{1}{7}$ of the *Groſs* and work as before.

If 18 ℔ *per* 112 ℔. for *Tare*, take the aliquot parts. *Viz.*

for 16 take the $\frac{1}{7}$ } Add the *tare* of 16 and
for 2 take the $\frac{1}{8}$ } the *tare* of 2 toge-
—— ther, the total subſtract from the
Gr. and work as before.

℔. ℔. ℔.
If 20 in 1 12 for *tare* for 16 take $\frac{1}{7}$ ℔.
for 4 take $\frac{1}{4}$ of 16

II. When an allowance is made for *Tret*, then (after the *Tare* is subſtracted from the Groſs) the remainder is called *ſubtle*, which Divide by 26, becauſe 4 ℔ is the 26th part of 104 (the allowance alwayes given for *Tret*) the Quot. gives the *Tret*, which ſubſtracted from the *ſubtle*, gives the *Neat* weight.

C. qt. ℔. ℔. ℔. ℔. ℔
Ex. 45—3—15 Gr. *Tare* 16 in 112 *Tret* 4 in 104
16 $\frac{1}{7}$ 6—2—6 *Tare*
39—1—9 *Subtle* 4)104
26
4
157
28
1265 25) 4405
314 180
169 245
11
4405 *pound ſubtle*
169 *Tret*
4236 *Neat pound* —— *at* 6 *d.*
6 $\frac{1}{2}$ 211|8 *d.*
105:18—0 *facit*

III. If

III. If the allowance for *Tare* be 8 ℔, 10 ℔, 12 ℔. in 112, or any other lesser number, whether an *Aliquot* part of 112 or not, in such cases, *divide the Gross into two parts* by 2, which will make it half hundreds, then say 8 is $\frac{1}{7}$ of $\frac{1}{2}$ *C.* or if 12 ℔ in 112 ℔. $\left\{\begin{matrix} 8 & \frac{1}{7} \\ 4 & \frac{1}{2} \end{matrix}\right\}$ When you have found your *Tare*, substract it alwayes out of the whole *Gross*.

I might enumerate Examples, but these being sufficient to instruct any ordinary Capacity in *Tare* and *Tret*.

I shall proceed to shew some other abbreviated ways of casting up Goods and Merchandize.

CHAP. XIII.

For Retaylers *of* Small Parsels, *as Mercers, Lynen and Woollen Drapers, Haberdashers of Hats*, &c.

THE most Abbreviated and ready way is to multiply the price by the Quantity.

Ex. Sold 7 *yrd* of Cloth at 14—6 a *yrd.*

$$\begin{array}{r} 7 \\ \hline \textit{fa. l.}\ 5—1—6 \end{array}$$

Say 7 times 6 is 42, which is 3 *s.* 6 *d.* ſet down 6 *d.* and carry 3 *s.* to the place of *ſhill.* and ſay 7 times 4 is 28, and 3 I carry is 31, ſet down 1 *s.* and carry 3 Angels to the place of *tens* of *ſhill.* and ſay 7 times 1 is 7, and 3 I carry is 10 Angels, which is 5 *l.* ſet a (o) in the place of *ſhill.* and fix the 5 *l.* in the place of *pounds*, ſo the price of 7 *yards* is 5 *l.* 1 *s.* 6 *d.*

Ex. 2. Sold 11 ½ *yards* at

	s.	*d.*	
	13	3	
	11		
	7	05	09
		6	07 ½
l.	7	12	04 ½

for half a yard take ½ of 13*s.*3*d* and add to the product of 11.

Ex. 3. Sold 14 ⅝ *yards* at

	l.	*s.*	*d.*	
	1	07	10	
			7	
	9	14	10	
			2	
	19	09	08	
4	½	00	13	11
⅝	¼	00	03	05 ¾
l.	20	06	00	¾

Find firſt the price of 7 *yards*, *ſa.* 9 *l.* 14 *s.* 10 *d.*, which Mult. by 2 gives 19 *l.* 9 *s.* 8 *d.* the price of 14 *yards*, then take the Aliquot parts of ⅝ for the price of one *yard*, as you ſee in the Operation: The *facit* is 20 *l.* 6 *s.* 0 *d.* ¾. *Ex.*

4. *Ex.* Sold 7 *C.* ½ of Currants at

	l.	*s.*	*d.*
	2	13	6
			7
	18	14	6
	1	6	9
sa.	20	01	5

Obj. There are many Numbers under 100 that are not included in the Mult. Table, or being *multiplyed together*, will not produce the given quantity; and so consequently cannot be done by this *new way of practice.*

Answ. It's very true, there are several numbers under 100, that no two numbers multiplyed together can produce them, such as 13, 17, 19, 26, 29, 31, 34, 37, and many more.

Rule. In such cases *Mult. by 2 such numbers as being multiplyed together will come nearest to such odd numbers, then multiply the price by that part which wants to make up the given quantity.* An Example of which follows.

5. *Ex.* 29 *Ells* at

	s.	*d.*
	7	9
		7
	2	14—3
		4
	10	17—0
	7	9
sa.	11	04—9

Here I Mult. by 7 and 4 because 7 times 4 is 28, and for the odd *Ell* to make it 29, I add the price of the Ell to the product, *sa.* 11*l.* 4*s.* 9*d.*

6. *Example*, If 34 Ells at the same price, Mult. by 8 and 4, makes 32, and multiply the price of 1 Ell by 2, and add that to the product, makes 34.

	C.	q.	℔		l.	s.	d.
7. *Ex.*	15	3	7	at	4	15	6
					23	17	6
							3
					71	12	6
					2	07	9
					1	03	10 ½
						5	11 ½
					l. 75	10	1

Goods Sold by 112 ℔ *the Cwt.* } 1. Account 2 *s.* 4 *d.* for every farthing in the price of 1 pound weight.

Ex. 1. At 3 ½ *d.* the pound, what 112 ℔

14 — *fa.* 32—8 *d.*

2. Or Mult. the pence, that 1 pound *wt.* cost by 7, and divide by 15, the Quot. is the price in pounds of a hundred weight.

Ex. At 5 *d.* the pound; what cost 112 ℔

7

15)35

fa. l. 2--6--8 *s. d.*

Say 15 in 32, 2 times rest 5, which is 100 *shill.* then 15 in 100, 6 times, rest 10, it makes 120 *d.* then 15 in 120 is, 8 times, *facit* 2 *l.* 6 *s.* 8 *d.*

3. Mult.

3. Mult. the pounds in mony that 112 coſt by 15, and divide the product by 7, the Quotient gives the price 1 pound coſt.

℔	*l.*	*s.*	*d.*		℔
If 112 coſt	2	6	8	what coſt	1.

5

11—13—4

3

7) 35—00—0

fa. 5 pence

Goods ſold by 100 } 4. Mult. the pence that 1 *l.* coſt by 5, and divide by 12, the product is the price in pounds.

At 15 *d.* the ounce what coſt 100 ounces?

5.

12) 75

facit 6 : 5 *s.*

5. Mult. the pounds in Mony 100 ℔ wt. coſt by 12, and divide by 5, the Quote gives in pence the price of 1 pound

	l.	*s.*		
If 100 coſt	6	5	what coſt	1

12

5) 75 : 00 *fac.* 15 *d.*

15

Things sold by 120. *such as Deals*, &c.

6. Mult. the pence that 1 cost by 2, and divide by 4, the Quote is the price of 120.

What cost 120 *Deals*, at 13 *d.* the Deal board?

2

4) 26

fac. 6—10

7. Or Divide the pence that 1 is worth by 2, the Quote will be pounds.

What cost 120 yards of Ribbon at 5 *d.*

fac. 2—10 *s.*

Wine or Oyl sold by the Tun of 252 *gall.*

8. So many pound the Tun cost, abate so many shillings, and the Gallon will be worth so many pence.

Ex. If 252 gall. cost 25 *l.* what cost 1 gall.

1—5

23—15 *fac.* 1—11 *s. d.*

Here

Here 20 *s.* is valued at 1 peny, so that 23 *l.* 15 *s.* is but 1 *s.* 11 *d.* $\frac{3}{5}$ the price of 1 Gallon of Oyl.

I might Add many more Rules of this Nature which I must omit, till I can Allot my self more Paper than is intended for this small Tract.

CHAP. XIV.

INTEREST

Is either *Simple* or *Compound.*

Simple Interest is that which ariseth or is computed from the Principal only. And here all Questions are done by the double Rule of Three (call'd the compound Rule of 5 Numbers) or Practice.

Ex. What will the Interest of 275 *l.* 11 *s.* 3 *d.* come to for a year at 6 *l. per Cent* ?

State your Question by the Rule of Three and say.

If

	l.		*l.*	*s.*	*d.*
If 100 gain	6,	what will	275	11	3
					6
		l.	16|53	07	6
		s.	10|67	20	
				12	
		d.	8|10		

	l.	*s.*	*d.*
fa.	16	10	8 $\frac{10}{100}$

Here 275 *l.* 11 *s.* 3 *d.* principal is multiplied by 6 *l.* (the Interest) being the middle number, and divided by 100 the first number by cutting off 2 Figures in the Dividend, rest 53 *l.* which multiplied by 20, gives 1067 shillings, which divided again by 100 as before, rest 67 *s.* which multiplied by 12 and divided as before, gives *fac.* 16*l.* 10*s.* 8 *d.* the Interest for 1 year.

	l. s. d.			l. s. d.	
	275-11-3	for a year		275-11-3	at 5 $\frac{1}{2}$ *per Cent.*
	5	at 5*l. per C.*		5	
	13|77-16-3			1377-16-3	
	20		$\frac{1}{2}$	137-15-7$\frac{1}{2}$	
	15|56			15|15-11-10$\frac{1}{2}$	
	12			20	
	6|75			3|11	
				12	
fa.	13—15—6 $\frac{75}{100}$			1|42	
				4	*l.* *s.* *d.*
				1|70	*fac.* 15—3—1$\frac{1}{4}$

What

What comes the Insurance of 975 *l.* 13 *s.* 4 *d.* to, at 4 Guyneas *per Cent.*

	l.	*s.*	*d.*
	975	13	4
		4 —	6 *s.*
	3902	13	4
5 ¼ —	243	18	4
1 ⅕ —	48	15	8
	41|95	07	4
	— 20		
	19|07		
	— 12		
	00|88		
	— 4		
	3|52		

fac. 41 – 19 – 0¾

l. *s.* *d.*
275 – 11 – 3 at 5 *per Cent.* for 14 months.

	l.	*s.*	*d.*
The Int. of 1 year is	13	15	6
2 Months ⅙ —	2	5	11
fac.	16	01	5 Int. for 14 *m.*

l. *s.* *d.*
275–11–3 at 5 *per Cent.* for 3 year 5 *m.* 20 *days?*

		l.	*s.*	*d.*
The Intereſt of a year is		13	15	6
which multiplied by the				3
3 years, and take Aliquot				
parts for 5 *months* and	*m.*	41	6	6
20 *dayes*, as you ſee in	$4\frac{1}{3}$	4	11	10
the operation.	$1\frac{1}{4}$	1	2	$11\frac{1}{2}$
dayes	$10\frac{1}{3}$	0	7	$7\frac{3}{4}$
	$10\frac{1}{3}$	0	7	$7\frac{3}{4}$
fac.		47	16	7

The way uſed by *Bankers* for caſting up *Intereſt* is generally by dayes *thus*,

They bring the principal Money into Pence, and Multiply it by the dayes it is out at Intereſt, and divide by 6083 for 6 *per Cent.* And 7300 for 5 *per Cent.* (which are the dayes of a year multiplied by 100, and divided by the rate of Intereſt). An operation in the Compound Rule of 5 Numbers, *viz.*

If 100 *l.* in 365 dayes gain 6 *l.* Intereſt, what will 75 *l.* gain in 94 dayes?

Exam.

l. s. d.

Exam. 275–11–3 at Interest 70 dayes (at 6 *per Cent.*

20

5511

12

66135

70

6083) 4629450 (761

37135

6370

287

12) 761 *pence* (6|3–5

fac. 3–3–5

6) 36500 (6083

Exam. 100 *l.* at Int. for 75 days at 5 *per C.*

20

2000

12

240|00

75

120000

168000

18000|00

fac. 20 *s.* 6 *d.*

365

100

5) 36500

7300

73|00|18000|00

340

12) 246| 480

fa. 20*s.* 6*d.* 42

CHAP.

CHAP XV.

Compound Intereſt *is that which ariſeth from the* Principal, *and alſo from the* Intereſt *thereof, and therefore is called* Intereſt *upon* Intereſt.

THIS ſort of Intereſt is counted very unlawful, and is ſeldom, or never allowed, but by particular Contract or Valuation of Money ſometimes on Purchaſes.

The beſt way of working *this ſort of Intereſt* is by Decimals.

Ex. 275*l.* 11*s.* 3*d.* forborne 5 years, at 6 *per Cent. per Annum*, Intereſt upon Intereſt, what will the ſame amount to?

Reduce the 11*s.* 3*d.* into a Decimal Fraction, according to the Third Rule of the Seventeenth Chap. of this Book.

11*s.* 3*d.* is $\frac{135}{240}$ of a pound *Sterling*.

which brought into a Decimal Fraction, is, 5625, the Operation of the Queſtion is, *viz.*

If

l.	*l.*	*l.*	
If 100 gain	6, what will	275, 5625	6
		16, 5337	
1 Year		292, 0962	6
		17, 5257	
2 Year		309, 6219	6
		18, 5773	
3 Year		328, 1992	6
		19, 6919	
4 Year		347, 8911	6
		20, 8734	
5 Year		368, 7645	

Fa. 368*l.* 15*s.* 4*d.*

Here the Third Number is Multiplyed by 6 the Second Number, and Divided by 100, the First number, which is done by setting out the Two first figures towards the right hand, and casting them away as you multiply them, to *abbreviate* the work of Multiplications, which would be very large, were they all set down, where 15, or more years Intereſt is forborne, beſides 4 or 5 places of Decimals will be correct to nigh a farthing,

or

or little more, ſo that the *facit* makes 365*l.* 15*s.* 4*d.* the Decimal Fraction being valued according to the ſixth Rule of the ſeventeenth Chapter of this Book.

Ex. 2. Suppoſe a Man buys a Leaſe of a Houſe for 40 years to come, at 47*l.* 10*s.* *per Annum*, at 12 years purchaſe, if he value his Money at 5 *per Cent.* how many years will it be before he receive all his Principal and Intereſt.

47—10
12
The Purchaſe 570—00

100 — 5 — 570 — — 5
28, 50

598, 50 Principal and Int.
47, 50 deduct the Rent.

1 Year — 551, 00 — 5
27, 55

578, 55 Prin. & Int. 2 yrs.
47, 50 deduct the Rent.

2 Year — 531, 05

And ſo proceed till you have reduced your Money to leſs than the yearly value of the Rent

Rent, which will shew you the Number of Years required to receive all the Principal Money.

CHAP. XVI.

REBATE or *DISCOUNT*.

Is, when a Sum of Money due at any time to come, is satisfyed by the payment of so much present Money, *as being put forth at a certain* Rate of Interest *for the time being, will be equal to the Sum* first due.

IN *Rebate*, 12 Months is the *first* number, the Rate of Interest the *second*, and the time proposed, the *third* Number.

Then say, if 100, and that *facit* (added together) *abate* that *facit*, what shall the given Sum *Rebate*.

The Quotient or Quotients shew the *Rebate*, which substracted out of the given Sum, shews the Money to be paid presently.

Exam. What will the Rebate of 795 *l.* 11 *s.* 2 *d.* come to for 11 Months, at 6 *l.* per Cent.

If

If 12 *mo.* give 6 *l.* what will 11 *mo.*? *facit* 5 *l.* 10 *s.* Then,

If 105 *l.* 10 *s.* Rebate 5 *l.* 10 *s.* what will 795 *l.* 11 *s.* 2 *d.* *facit* 41 *l.* 9 *s.* 5 *d.*

Ex. 2. The Rebate of 795 *l.* 11 *s.* 2 *d.* come to for 17 *mon.* at 6 *per Cent.*

If 12 *mo.* give 6 *l.* 17 *mo.* *facit* 8 *l.* 10 *s.*

If 108 *l.* 10 *s.* Rebate 8 *l.* 10 *s.* what 795 *l.* 11 *s.* 2 *d.* *facit* 62 *l.* 6 *s.* 5 *d.*

Ex. 3. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid at 2, 3 Months, (*that is half at* 3 *months, and the other half at* 3 *months after that*) if all the Money be paid presently, what must be discounted.

—First, Divide the given Sum into Two parts, according to the time of payment, then say,

	l.	*s.*	*d.*
	795	11	2
2)			
	395	17	7

If 12 *mo.* give 6 *l.* what will 3 *mo. fa.* 1 *l.* 10 *s.*

If 101 *l.* 10 *s.* abate 1 *l.* 10 *s.* what will 397 *l.* 15 *s.* 7 *d.* *facit* 5 *l.* 17 *s.* 6 *d.*

If 12 *mo.* give 6 *l.* what will 3 *months* give, *facit* 3 *l.*

If 103 *l.* abate 3 *l.* what will 397 *l.* 15 *s.* 7 *d.* *facit* 11 *l.* 11 *s.* 8 *d.*

Add the Sum of the Rebates together, and subtract it out of the given Sum, shews the Money to be paid presently.

795—11—2

5—17—6
11—11—8

All the Rebate 17—09—2

The Money to be paid present. 778—2—0

Ex. 4. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid at 3, 2 *months*, if all the Money be paid presently, what must be discounted? Divide the given Summ into three parts, and work as before. *fa.*

Ex. 5. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid at 4 years 1 month, if all the Money be paid down, what must be discounted. *fa.* 198 *l.* 17 *s.* 9 $\frac{1}{2}$ *d.*

Divide your Money in 4 payments, then work as before, *Viz.*

12 *mo.* — 6 *l.* — 1 *mo.* — *fa.* 10 *s.*
100 *l.* 10 *s.* abate 10 *s.* what will 198 *l.* 17 *s.* 9 *d.*
fa. 19 *s.* 9 *d.*

12 *mo.* — 6 *l.* — 2 *mo.* — *fa.* 1 *l.*
101 *l.* — 1 *l.* — 198 *l.* 17 *s.* 9 *d.* *fa.* 1 *l.* 19 *s.* 4 *d.*

12 *mo.* — 6 *l.* — 3 *mo.* *fa.* 1 *l.* 10 *s.*
101 *l.* 10 *s.* abate 1 *l.* 10 *s.* what 198 *l.* 17 *s.* 9 *d.*
fa. 2 *l.* 18 *s.* 9 *d.*

12 *mo.* — 6 *l.* — 4 *mo* — *fa.* 2 *l.*
102 *l.* abate 2 *l.* what will 198 *l.* 17 *s.* 9 *d.*
fa. 3 *l.* 17 *s.* 11 *d.*

CHAP.

CHAP. XVII.

FRACTIONS

Are of two kinds Vulgar, *and* Decimal.

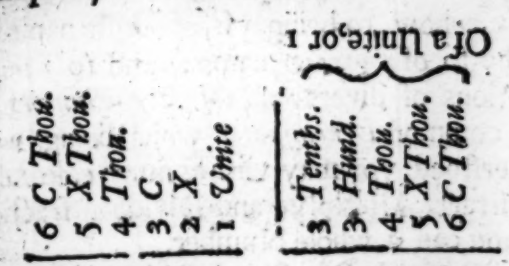
A *Vulgar Fraction* is caused by Division of whole Numbers, the Remainder of which being less than the Divisor, called the Numerator, is alwayes the *Dividend*, and the Denominator is the *Divisor*.

3 Numerator,
4 Denominator.

A Decimal Fraction is such a one, whose Denominator is understood, and therefore need not be expressed: And is an *Unit* with as many Cyphers following it, as there be Figures and Cyphers in the Number.

Having told you the Nature, I proceed now to show you the use of *Vulgar* and *Decimal Fractions* together under the same head, and that with all plainess, and yet with as much brevity as the Nature of the thing will bear.

In Decimals the value of every *figure* or *Cypher decreases* by a ten-fold proportion from the Unites place towards the right hand as the *whole numbers* do towards the left hand, as in the Table, *Viz.* 6 C. Thou.



Cyphers annexed to a Decimal Fraction, alters not his value.

as thus { ,50 ,500 ,5000 } expressed in { 5/100 5/1000 5/10000 } Decimals Vulgar Fract.

Each Decimal being equal to $\frac{1}{10}$ of any Integer as you see expressed by Vulgar Fractions.

Cyphers prefixed to a Decimal Fraction, decreaseth its Value by a ten-fold proportion.

as thus { ,05 ,005 ,0005 } expressed by { 5/100 5/1000 5/10000 } Decimals Vulgar Fract.

Next to Abbreviation and Valuation of *Vulgar Fractions*, there is little required, but

to

to *know* how to bring a fr. of a *lesser* name into the fr. of a *greater* name: And to *Reduce* fractions of divers *unequal Denominators* to one common *Denominator* which being well understood, you may with as much ease Add, Substract, Multiply, and Divide a fraction as you can a whole Number.

In Decimals a fraction is seldom abbreviated, therefore,

I. *To abbreviate any Vulgar fraction*, find such a Number for dividing both the Numerator and Denominator thereof, so that no Remainder be on either of the Divisions.

Ex. Abbr. $\frac{96}{120}$ into $\frac{8}{10}$ | $\frac{4}{5}$ its lowest terme.

Say 12 in 98, 8 times, and 12 in 120, 10 times, then the fr. is $\frac{8}{10}$, then say, 2 in 8, 4 times, and 2 in 10, 5 times, then the fr. is $\frac{4}{5}$, so that 4 is to 5, as 96 to 120.

2. *To know what part of a pound sterling any number of shill. and pence are*, Bring the shill. and pence into pence for a Numerator, and place 240 under it, (the pence of one pound) for a Denominator.

Ex. What part of a *l.* is $\begin{array}{r} s.\ \ d. \\ 11-3 \\ \underline{12} \\ 135 \end{array}$ *fa.* $\frac{135}{240}$.

3. *To*

3. *To Reduce Vulgar Fractions into Decimals, Add* Cyphers at pleasure to the numerator, and divide by the Denominator.

s. *d.*

Exam. Reduce 11—3 into a Decimal fr.

12

135 — *fa.* ,9625

240

24|0)1350000

150

60

120

0

Ex. Reduce $\frac{4}{5}$ into a Decimal fraction.

5)4000

,800 *fa.* ,800

4. *To value a Vulgar Fraction,* Multiply the Integer into the Numerator, and Divide by the Denominator.

What is the $\frac{4}{5}$ of a pound Sterling. *s.* 20

5

8|100

s. *d.* *fa.* 12—6

An Ell of Cloth worth 7—9 what is $\frac{2}{5}$.

2

5)15-6

fa. —3—1 $\frac{1}{5}$.

5. *To Value a mixt Number*, Multiply the mixt Number by the Numerator, and Divide by the Denominator.

Ex. A Ship worth 794 — 11 — 9, what is $\frac{5}{8}$ worth.

	l.	*s.*	*d.*
			5
8)	3972	— 18	— 9
fa.	496	— 12	— 4 $\frac{1}{8}$.

6. *To value a Decimal Fraction expressing Coyn.* Every *Prime* or *Unite* in the first place is 2 *s.* value. Every 5 in the second place is 1 *s.* and the rest farthings, but if they exceed $\frac{25}{48}$, there must be one farthing abated.

Ex. Reduce $\frac{7}{9}$ of a pound into a Decimal fraction.

9),700000
,77777

Here 2 *primes* is 14 *s.* and 5 taken out of the *second* place is 1 *s.* which makes 15 *s.* then 2 remains, which is 27 to the *thirds*, or place of farthings, out of which abate 1 for $\frac{25}{48}$, it makes *fac.* 15 *s.* 6 *d* $\frac{1}{2}$. which is the $\frac{7}{9}$ of a pound Sterling.

7. *To Reduce Vulgar Fractions to a Common Denominator*, Multiply the *Numerator* of

of each Fraction into every *Denominator*, except its own, so that product is a *new Numerator*, then Multiply all the Denominators continually together, so is that product a *Common Denominator* to all the *New Numerators*. *l.* *l.*

Ex. Reduce $\frac{2}{3}$ and $\frac{3}{4}$, to a Common Denom.

fa. $\frac{8}{12}$ and $\frac{9}{12}$.

Here 12 is the Common Denominator to both the *New Numerators, Viz.* 8 and 9, so that 8 is to 12, as 2 to 3, and 9 is to 12, as 3 to 4.

l. *l.*

So that $\frac{8}{12}$ is = to $\frac{2}{3}$ and $\frac{9}{12}$ is = to $\frac{3}{4}$.

Reduce $\frac{3}{4}$, and $\frac{5}{8}$, and $\frac{7}{12}$ of a *l.* to a Com. Den.

4	—	—	—	
6	18	40	42	*To prove your Work,*
—	8	4	4	Divide your new
24	—	—	—	Numerator by the
8	144	160	168	Numerator of that
—	—	—	—	fract. and Divide
192	192	192	192	the Com. Denominator of the fr.

by the Denominator, if both Quotients are equal, your Work is true.

Example 144 | 48 here 144 divided by 3, makes 48, and 192 divided by 4, gives 48, which was to be proved. Or, you may prove your work by Abbreviation of fra-

ctions, but that is attended with much difficulty, where 4 or more fractions are reduced to a Common Denominator.

Now this *Reduction of fractions* is of little use, otherwise than to prepare a Fraction, to be either *Added*, *Substracted*, *Multiplyed*, or *Divided*.

So if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l.* were to be added together, Reduce them first into a Common Denominator, as in the last Rule, it makes *fa.* $\frac{144}{192}$ and $\frac{169}{192}$ and $\frac{168}{192}$, Add all the new Numerators together, makes 472, which divide by 192 the Common Denominator, makes *fa.* 2℔ $\frac{88}{192}$ as in the following Example.

	144			
Addit. of Vulg.	160			
Fractions.	168			
		l.	*s.*	*d*
192)	472	*fa.* $2\frac{88}{192}$, or	9	—2
2	88			

So if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l.* were to *be added* together in *Decimals*, Reduce them first into Decimal fractions according to the Third Rule of this Chapter, and the Operation stands, *viz.*

Addition

0000

Addition of Decimals.

¾	,75	Say 4 in 30 is 7 times, and 4 in 20 is 5 times, and so for the rest.
⅙	,8333	
⅞	,875	
fa.	2,4583	*l. s. d.* or , 2—9—2

By this Addition you see how much less work is made by *Decimals* than is in *Vulgar fractions*, and how easie their Value is found out according to the Sixth Rule of this Chap.

8. *To Reduce* (*Compound Fractions* or) *fractions of a lesser name into the fractions of a greater*, Multiply the *Numerators* together for a new *Numerator*, and the *Denominators* multiply together for *a new Denominator*.

Reduce ¾ of a penny into the proper fraction of a pound *Sterling*.

Say ¾ of $\frac{1}{12}$ of $\frac{1}{20}$ or ¾ of $\frac{1}{960}$, *fa.* $\frac{3}{960}$.

9 *To Reduce a mixt Number of a lesser Name into the fraction of a greater.* Reduce the mixt Number into an improper fraction, and work as before:

Reduce 3 *d.* ½ into the prop. fr. of a *l. ster.*

7/2 of $\frac{1}{12}$ of $\frac{1}{20}$ or 7/2 of $\frac{1}{240}$, *fa.* $\frac{7}{480}$.

By the same Rule you may *Reduce* any sort of Weight or Measure.

For Compound Fractions, their use is chiefly to bring fractions of divers denominations to one and the same denomination:

So if the $\frac{3}{4}$ of a penny, $\frac{2}{3}$ of a shill. and $\frac{7}{8}$ of a pound were added together.

The $\frac{3}{4}$ *d.* must be Reduced into the fra. of a *l* and the $\frac{2}{3}$ of a shill. must be reduced into the fra. of a *l*, thus.

$\frac{3}{4}$ of $\frac{1}{240}$ *fa.* $\frac{3}{960}$ } then the fractions to be
$\frac{2}{3}$ of $\frac{1}{20}$ *fa.* $\frac{2}{60}$ } *added*; are $\frac{3}{960}$, and $\frac{2}{7}$, and $\frac{7}{15}$ which Reduce to a Common Denominator, and add them together, either by Decimals or Vulgar fractions.

CHAP. XVIII.

ADDITION of FRACTIONS.

1 IF *the Fractions to be added have one Common Denominator*, Add all the Numerators together, and divide the product by the Common Denom.

Examp.

Example Add $\left\{\begin{matrix}\frac{8}{12}\\ \frac{5}{12}\\ \frac{7}{12}\end{matrix}\right\}$ of a pound together.

12)20

fa. 1 $\frac{8}{12}$

2. *If the fractions to be added be of different denominators.* Reduce them to a Common Denominator, according to the Seventh Rule of the last Chap. and proceed as before.

Ex. Add $\frac{7}{8}$ and $\frac{3}{4}$, and $\frac{5}{3}$ *l.* together.

8				
4	28	24	8	84
3	3	3	8	72
32				64
3	84	72	64	
96	96	96	96	96(220

fa. 2:28

To add $\frac{7}{8}$ and $\frac{3}{4}$ and $\frac{2}{3}$ *of a pound in Decimals,* Reduce them into Decimal Fractions according to the Third Rule of the last Chap. and add them up as in whole Numbers, keeping the place of Units just under each other.

Ex. 0000

Add $\frac{7}{8}$,875
$\frac{3}{4}$,75
$\frac{2}{3}$,6666

l. *s.* *d.*
2,2916 *fa.* 2—5—10

CHAP. XIX.

SUBSTRACTION of FRACTIONS

I. TO *subtract Fractions of different denominators*, Reduce them to a Common Denominator, and subſtract the leſſer fr. from the greater.

Examp. From $\frac{3}{4}$ *l.* take $\frac{2}{3}$ *l.* from $\frac{9}{12}$
take $\frac{8}{12}$
9 8
fa. $\frac{1}{12}$.

II. *If you have a mixt number, (or Integer and Fraction) and the fra. to be ſubſtracted be greater than the fraction from which you are to ſubtract.*

Borrow

Borrow an Integer from the mixt Number, and work as in the Subtraction of whole Numbers.

Examp. from 11 $\frac{1}{5}$ — 1 $\frac{2}{4}$ Here I cannot take
take 2 $\frac{3}{4}$ — 9 $\frac{9}{12}$ out of $\frac{8}{12}$, therefore I borrow an Integer, *viz.* 12, and say 9 out of 12, reſt 3, to which add $\frac{8}{12}$, reſt $\frac{11}{12}$, and carry 1 to 2 is 3 *l.* out of 11 *l.* reſt 8, ſo the *facit* is 8 $\frac{11}{12}$.

From 35 $\frac{3}{12}$	from 42
take 19 $\frac{7}{12}$	take 16 $\frac{15}{24}$
facit 15 $\frac{8}{12}$	*fa.* 25 $\frac{9}{24}$

Subtraction of Decimals is the ſame as in whole Numbers, keeping the place of Unites juſt under each other.

l.	*l.*	*s.*	*d.*
From $\frac{7}{8}$,875	the $\frac{7}{8}$ is	— 17	— 6
take $\frac{3}{4}$,75	$\frac{3}{4}$ is	— 15	—
Reſt ,125	*l.* *s.* or 2–6	reſt 2–6 equ. to the Decimal, 125.	

CHAP. XX.

Multiplication of *FRACTIONS.*

I. *TO Multiply proper Fractions*, Multiply the Numerators together for a new Numerator, and the Denominators Multiply together for a Denominator.

Ex. Mult. $\frac{7}{8}$ by $\frac{3}{4}$, *fa.* $\frac{21}{32}$.

II. *If a mixt Number and a fraction are to be multiplyed together*, Reduce the Mixt Number into an improper Fraction, and work as in the last.

Ex. Multiply $11\frac{2}{3}$ by $\frac{3}{4}$

$\frac{35}{3}$ by $\frac{3}{4}$, *fa.* $\frac{105}{12}$.

l. *l.*

Ex. Multiply $11\frac{2}{3}$ by $2\frac{3}{4}$,

l. s. d.

$\frac{35}{3}$ by $\frac{11}{4}$ *fa.* $\frac{385}{12}$, or 32-1-8

III. *To Multiply a mixt Number by an Integer*, Make the Integer an improper fr. by placing [1] under it, and Reduce your mixt Number into an improper fraction and work as in the first Rule.

Ex.

Ex. Multiply $7\frac{5}{8}$ by 4

$\frac{61}{8}$ by $\frac{4}{1}$ *fa.* $\frac{244}{8}$

IV. *Multiplication of Decimals* is the same as in whole Numbers, saving as many *Decimal parts* as are in both Multiplicand and Multiplyer, *so many* must be cut off from the product, which if it have not so many places, the defect must be supplyed with Cyphers towards the left hand.

Multiply 11,83
by 2,87

82,81
9464
2366

facit 33,9521

CHAP. XXI.

DIVISION of *FRACTIONS.*

I. TO *Divide Single Fractions:* Reduce them to a Common Denominator, and Divide the *new* Numerator of the Dividend

dend by the *new* Numerator of the Divisor.

Ex. Divide $\frac{7}{8}$ by $\frac{3}{4}$, 24)28

28 24 *fa.* $1\frac{4}{24}$

II. If it happens that the fraction of the *Divisor* be greater than the fraction of the *Dividend*, after you have Reduced them to a Common Denominator, the *facit* of such Division is a fraction.

Ex. Divide $\frac{3}{4}$ by $\frac{7}{8}$.

24 28 *fa.* $\frac{24}{21}$.

III. *To Divide an Integer by a Fraction,* Multiply the Integer into the Denominator, and Divide by the Numerator.

Ex. Divide 8 by $\frac{5}{3}$

3 5)48

4

12 *facit* $9\frac{3}{5}$.

IV. *To Divide a Fraction by an Integer,* The Numerator is Numerator, and the Integer Multiplyed by the Denominator, is Denominator.

Example

Example Divide $\frac{3}{4}$ by 3, 4

3

12 *fa.* $\frac{3}{12}$

V. *To Divide a mixt Number by an Integer,* Reduce the mixt Number into an improper Fraction, whose Denominator Multiply by the Integer for your Divisor.

Divide $3\frac{5}{8}$ by 2.

$^{8}\frac{7}{8}$ by $\frac{2}{1}$ 16)27

$1\frac{11}{16}$ *fa.* $1\frac{11}{16}$.

VI. *To Divide a mixt Number by a Fraction,* Reduce the mixt number into an improper fraction, and work as before.

Example, Divide $3\frac{3}{4}$ by $\frac{4}{7}$

$^{15}\frac{}{4}$ by $\frac{4}{7}$

105 16) 105

9

fa. $6\frac{9}{16}$.

VII. *To Divide an Integer by a mixt number.* Reduce the Mixt Number and Integer into improper Fractions, and proceed as before.

Example

Example, Divide 5 by $3\frac{3}{5}$

$\frac{5}{1}$ by $\frac{18}{5}$ 18) 25

7

fa. $1\frac{7}{18}$

VIII. *To Divide a mixt Number by a mixt Number*, Reduce them into improper Fractions, and Divide as before.

Example Divide $3\frac{3}{5}$ by $2\frac{3}{4}$

$\frac{18}{5}$ by $\frac{11}{4}$ 55) 72

17

fa. $1\frac{17}{55}$

Division of Decimals is the same as in whole Numbers, till the work be done. And then use the Converse of the Rule for Multiplication, *Viz.* so many *Decimals* as are in the Dividend, so many there must be in the *Divisor and Quotient*: And if there be not so many, the *Quotient* must be supplyed with Cyphers towards the left hand.

Example

Example Divide 33,9521 by 2,87

2,87)	525
	2382
fa. 11,83	861
	00

See the Converse in Multiplicat. of Decimals.

CHAP. XXII.

The Rule of Three in Fractions.

RULE: You must Multiply your Second and Third Numbers together, and Divide by your first.

Observing the same Method as in whole Numbers, *Viz.* That the first and third Numbers be of one Name or Denomination.

Ex. If $3\frac{1}{2}$ *d.* buy $\frac{2}{3}$ ℔. of *Tobacco*, what shall $95\frac{3}{4}$ *l.* buy

$\frac{7}{2}$ of $\frac{1}{240}$

l.	*s.*	*d.*
$\frac{7}{480}$	$\frac{2}{3}$	$95\frac{3}{4}$
	4	
		$\frac{383}{4}$ by $\frac{2}{3}$
		$\frac{766}{12}$ *fa.*

Divide

Divide $\frac{766}{7}$ by $\frac{7}{480}$

7	766
84	2880
	2880
	3360
84)	367680
	316
fa. 4377 lb.	648
of Tobacco.	600
	12

CHAP. XXIII.

Menſuration of Plain Superficies.

The Menſuration of plain Superficies (or Flat-Meaſure*) ſuch as Board, Glaſs, Wainſcot, Painting, and the like.*

Note 1. THAT in *Superficial Meaſure*, 12 times 12 Inches, being 144 Inches, are the Number of Inches contained in a Square foot of Superficial Meaſure.

2. That to ſquare any Number, is to Multiply it in it ſelf, as if you would know how many ſquare feet is contained in a Yard

Yard ſquare. Multiply 3 the feet in one yard by 3, the Product is 9, and ſo many feet make a yard ſquare.

Ex. howmany ſquare Inches are there in 1 yard ſquare.

1 yard is 3 feet
12

36 inches
36

216
108

fa. 1296 inches.

General Rule is to Multiply the length by the Breadth, the Product is the Content.

1. *Ex.* A Boord 12 foot long, and 14 Inch. 12 broad, how many ſquare feet?

144
14

576
144

144) 2016 Inch.
576

fa. 14 feet
00

inc. 12 foot
$2\frac{1}{6}$ —— 2

fa. 14 ſqu. feet.

But

But the beſt way is to take Aliquot parts for 14 Inch: as you ſee wrought in the laſt Example. And this being the moſt practical and ready way, I ſhall purſue it in all the Variety of Superficial Menſuration that followeth.

Ex. 2. A piece of Wainſcot 24 foot, 11 inch. long, and 11 foot deep, how many ſquare yards.

foot	inch.		yd.	fo.	in.
24	9		8	0	9 long
	11 Mult.		3	2	0 deep
9)272	3	*Or thus,*	24	2	3
			1⅓	2	2 3
fa. 30	0 8		1⅓	2	2 3
			fa. 30	0	9

Here 24 foot 9 Inch. is Multiplyed by 11 foot the height, which makes 272 foot 3 inch. that divided by 9, gives 30 yards, 8 inches, and ⅓.

But the eaſieſt and beſt way is to bring the height and length into yards, and then Multiply them as you ſee in the Example following.

3. *Ex.* A Painter hath done a Room 98 foot about, and 11 ½ foot high, I demand the Square Yards therein.

yrd.

yd.	fo.	in.
32	2	0
3	2	6
98	0	0
1 ¼ — 10	2	8
1 ⅓ — 10	2	8
6 ½ — 5	1	4
fa. 125	0	8

foot
3)98
32—2 feet

yds. feet in.
Anf. 125—0—08

4. *Ex.* A *Glafier* hath done a pain of Glafs of 5 foot, 73 high, and 2 foot, 54 broad, at 6 *d.* the foot ſquare.

Note, The *Glafiers* foot is divided into 10 parts, and every part into 10 parts more.

5,73
2,54
2292
2865
1146
fa. 14 ⅓ or 14,5542 — 14,5542 foot.

A General Rule to Meaſure Round or Square Pillars.

Multiply the length by the Circumference for *Round Pillars.*

And for *Square Pillars*, Add the 4 ſides or breadth together, and multiply the Total by the length.

5. *Ex.*

Ex. 5. A Painter hath done a Pillar of 6 foot 3 inch Circumference, and 14 foot 9 Inches long, I demand the Square yards of Painting.

	yrd	fo.	in.	
	4	2	9	length
	3	0	3	circumf.
inch.	9	2	6	
32 — $1\frac{3}{12}$	0	1	2	$\frac{9}{12}$
fa.	10	1	6	$\frac{9}{12}$

Ex. 6. A Pillar 6 yard 2 foot 5 inch. long, and 2 foot 1 inch in breadth each ſide, how many ſquare yards.

	yrd.	fo.	in.	
	6	2	5	length
	3	0	0	breadth
yrd. fo. in.				
3 — 0 — 0 br. *fa.*	20	1	3	

For *Regular Poligons*, Add all the ſides together, and Mult. the Total by the length.

For *Cones*, Multiply half the length by the Circumference.

For *Pyramids*, Add all the breadths at the Baſe together, and Mult. half the length by the Total.

For *Globes*, Multiply the Area of the Circle by 4, it gives the Content.

CHAP.

CHAP. XXIV.

Menſuration of Solids.

Solids, *ſuch as Stone, Timber, &c. are Meaſured by the* Cubick *or* Solid *foot, now a Cube is a figure like a Dye of 6 equal ſides, and a Cubick foot contains 12 inches ſquare on every ſide.*

THE *Rule is,* Multiply the length by the breadth, and that product multiply by the depth, which divide by 1728, the Cubick Inches in a foot Solid.

Ex. A piece of Timber 16 foot long 14 Inches broad, and 9 Inches deep, how many Solid feet doth it contain ?

12		16	
12		12	
144		192	
12		14	
1728		768	
		192	
		2688	
		9	
	1728)	24192	*fa.* 14 foot
	14	6912	
		000	

Ex.

Ex. A Stone 7 foot 3 inch. long, 4 foot 5 broad, and 2 foot 3 inch. deep, how many ſolid foot?

7—3	4—5	2—3
12	12	12
87 length	53	27
53 breadth		
261		
435		
4611		
27 deep		
32277		
9222		
ſa. 124497 Cubick inches		

1728) 124497 (*ſa.* 71 ſolid feet 1609
3337

To find how many Inches in length make a foot of ſquare Timber, Multiply the number of Inches ſquare in it ſelf for Diviſor, and make 1728 the Cubical Inch of a foot your Dividend.

Ex. A piece of Timber 18 inch. ſquare, what length will it require to make a foot ſolid.

18
18
144
18
324) 1728
ſa. 5 in 108

Ex.

Ex. How many Inches in length will make a foot at 12 Inch. Square?

12
12
---
144) 1728
288
---
fa. 12 in. 00

CHAP. XXV.

Menſuration of Plank.

A Table ſhewing how many foot of Plank of all Natures make a Load or Tun of Timber,

50 Foot a Load,			40 Foot a Tun		
Inch	foot				
4 plank	150		3		
3	200		4		which di-
2 ½	240		4 ½		vided by
2	300	make a	6		gives the
1 ½	400	Load	8		quantity
1	600		12		of feet,
	800		16		

Inch.

Inch	foot			
4 plank	120	make a Tun	3	which divided by gives the quantity of feet.
3	160		4	
$2\frac{1}{2}$	192		$4\frac{4}{5}$	
2	240		6	
$1\frac{1}{2}$	320		8	
1	480		12	
$\frac{3}{4}$	640		16	

Ex. In 7685 foot of 4 Inch Plank, how many Load and Foot of Timber.

15|0) 768|5
18|5) 35 load foot
51 35 $11\frac{2}{3}$ foot *fa.* 51 11

2 *Ex.* In 7685 foot of 3 Inch plank how many tun and foot of Timber?

16|0)768|5 Tun foot
128 *fa.* 48—1
48 $\frac{1}{4}$4)5
0 $1\frac{1}{4}$

The remayner of the Division is divided by the third Collum, as in the Example above the 7685 foot is divided by 160, the number of feet that make a Tun of 3 Inch Plank and 5 remains, which divide by 4 the ffgure even with it, gives 1 foot $\frac{1}{4}$, so the *facit* 48 Tun $1\frac{1}{4}$ foot.

THE END.